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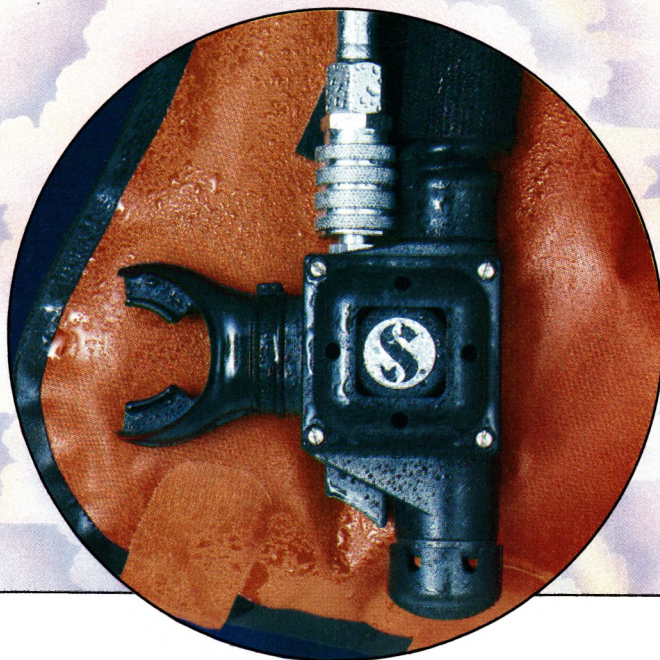
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FALL 1979

DESTINATIONS



PAUL HUMANN

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and Douglas Faulkner

It's still not part of every diver's regimen, but those who make the trip find infinite coral walls, land-locked seas and gentle Pacific people.

Cover: Giant tube sponges in Bonaire, Netherlands Antilles by David Doubilet.

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by Lou Fead

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Inside Sport Diver

New ocean technology: We'

Diving is a singularly technical pursuit. Like the wilderness sports, it brings us into a direct relationship with the elemental forces, but unlike hikers and campers, divers must festoon themselves with 50 pounds of devices, gauges and gadgets before they can safely enter the aquatic retreat. It's not that other sports don't employ high technology, but a camper minus his Nikon and Coleman stove is still a camper. A diver without his gear is in trouble.

As enthusiasts, we're interested in increasing the technology available to us. It lets our equipment do more, and makes it weigh less and last longer.

Unfortunately, research costs. In such a complex area, it costs a lot.

Although the sport equipment manufacturers have made noteworthy research and development contributions, their efforts are funded through equipment sales. The amount of research that can be done on a piece of equipment is, to some extent, limited by the amount of money divers are willing to pay for that item. So most of the progress seen in diving technology has come to sport divers in the form of spin-offs from research aimed at solving the problems of military and commercial divers.

Now the good news. The Outer Continental Shelf Lands Act Amendments of 1978 directs the Secretary of Commerce, through the secretary of the National Oceanic and Atmospheric Administration, to "conduct studies of underwater diving techniques and equipment suitable for the protection of human safety and improvement of diver performance." Sounds like it's aimed right at us, doesn't it? It isn't. In line with the Carter administration's refusal to see in the oceans the kind of opportunity John Kennedy saw in space, the Act is aimed squarely at implementing short-range economic goals: the exploitation of offshore oil and gas. And even as the Act's thunderous pronouncements came rolling off Capitol Hill, there is still no funding appropriated to carry them out.

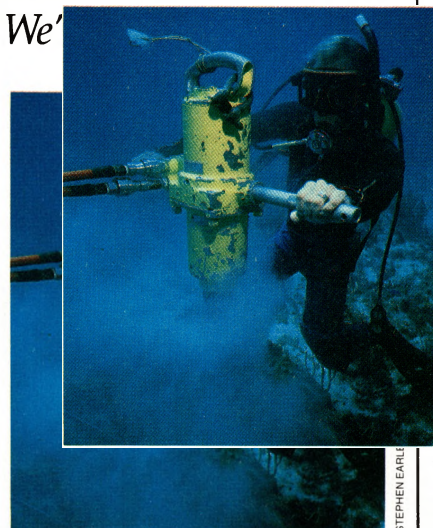
The new program will not likely produce breakthroughs in new equipment. Instead NOAA hopes to provide basic research support and encourage private industry to develop advanced diving gear. It has worked before. The mini-submarines featured on page 174 ("Downsizing Comes To Submarines") were developed for commercial applications by private contractors.

Private industry seems to have a better supply of courage than the federal government, and corporations are moving into the ocean. Lockheed Missiles and Space Company, Dillingham Corporation and the State of Hawaii jointly funded construction of the Ocean Thermal Energy Conversion plant (page 77) now operating off the Kona coast. Successful joint ventures like this may eventually give legislators the courage to make the right decisions on ocean research.

Meanwhile, we'll have to settle for halfway measures like the OCS Lands Acts Amendments. We've already put a man on the moon. Campers use "space blankets" made of material developed to keep astronauts warm. Microelectronics created for the Apollo program are sold in every drugstore in America.

An all-out oceans effort would provide similar benefits—for the public as well as the diving community. Granted, it would be divers that would benefit most, but the way I see it, we've waited long enough. I certainly have no quarrel with campers. But I am hoping that it's now *our* turn. ☺

Steve Blount, Editor



STEPHEN EARLE

A black and white photograph of a diver underwater, silhouetted against a bright light source. The diver is holding a camera and appears to be taking a picture. Bubbles are visible around the diver's head.

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The reef at Andros Island in the Bahamas is the third largest Barrier Reef in the world. For three weeks this summer it will be a classroom for a special summer program in Underwater Photography and Marine Biology offered by Florida Institute of Technology. This program offers eight college credits in Underwater Photography and Marine Biology.

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The Mail

Breaking the Laws of Gasses

Re: "A Spring Tune-up for Your Gear" (Summer 1979). First of all, rust doesn't turn any gas into anything, let alone into carbon monoxide. What happens is that the oxygen in the air becomes bound by the iron in the steel tank and together they become rust. The mixture of gasses that remains is simply low on oxygen and that's what makes it dangerous to breathe. Dave Inman states that if one were to store a tank with 500 psig over the winter and then had it topped off to 2000 psig that as much as "...25 per cent of your air supply could be carbon monoxide—a deadly concentration."

This presumes that all the gasses that were present in the 500 psig mixture were somehow turned into CO. Believe me, changing the 78 per cent of the air that was nitrogen into CO is a job best left to an alchemist.

The real dangers of breathing old air from steel tanks are compelling enough. We do not need make believe.

Tim Bitler
Pittsburgh, PA

A Bad Case of Wrongworm

In your recent article "Profile: Leni Riefenstahl," Summer 1979, you incorrectly identified the sabellariid worm on page 113 as the *Spirobranchus giganteus*. That worm is commonly known as the Christmas tree worm. Though from the photo it is difficult to be precise, your illustration appears to be the *Sabellastarte magnifica*.

R. G. Bachand
Norwalk, CN

U-352 Surfaces...Again

I am writing in regard to Senator Lowell Weicker's column in the Summer 1979 issue. Weicker should be condemned for his efforts to destroy the U-352. What people don't realize is that Weicker is a politician; he is a part of the government. If he gets his foot in the hatch and does have the U-352 destroyed, what is next, the WR-2, the Hutton, the John D. Gill? The list is endless. Creeping "big brotherism" is strangling our freedom little by little, day by day. Weicker writes "...government reg-

ulators may be slipping through the back door." If they are coming through the back door, it is because Weicker has let them in.

Tim Brown
Charlotte, NC

Doing Bottom Time

I have been reading *Sport Diver* ever since the first edition and can not express in words the enjoyment I receive. My community owes you an incalculable debt as it is due to my absence from the streets. Enough said.

The only problem is, I've lost one or two copies since the last time the police searched the place. I have strong suspicions about my friends in blue.

How come I haven't seen any type of magazine binders advertised by *SD* for the containment and arrest of same? What gives?

Also, what's the address of that Senator Weicker rat who wants to wipe out that U-boat off the coast of North Carolina? I'm not going to mail him a letter bomb, so no need for the *SD* staff to get uptight.

Your cellmate,
Jim Hammers, Jr.
Fort Martinville, LA

The Power and the Poison

After reading "Offshore Nuclear Reactors: The Power and the Poison" (Summer 1979), I wrote a letter I'd intended to write for some time:

Dear Governor Brown,

Please use your power as governor to close the Rancho Seco nuclear power plant and stop the Diablo Canyon plant.

Every nuclear power plant will, sooner or later, become a Three Mile Island nightmare.

Burton Wilson
Santa Barbara, CA

You would think after Three Mile Island, Karen Silkwood, *China Syndrome* and all the rest that the nuclear industry would at least slow down, back off and reevaluate safety questions that concern us all. Instead it's business as usual, and we may be heading for Passover II except that this time nobody's children will be

spared. Ah, for the good old days when we used to worry about the enemy dropping the bomb on us.

Perhaps my sister, who lives in Harrisburg, if she's ever able to have children, can revolutionize underwater breathing techniques. Gills are so good for that sort of thing...

Rick Reichman
Nashville, TN

Cold Shutdown

The article by C. K. Stewart "Nuke Diving: The Hot Bath Treatment" (Summer 1979) certainly went critical with enthusiasm but part of the exposed core of information seems to have been damaged.

In January, 1963, four divers made 28 dives carrying out repairs in the Big Rock nuclear plant in Michigan. In December, 1973, the Ocean Corporation of Houston, Texas, carried out 71 dives in the Palisades nuclear plant.

When Mr. Shourot said "we were the first," I assume he meant that they were the first to dive in the New York plant mentioned in the article, not the first to dive in a nuclear reactor.

Stewart's article is a melt down, and we hope the contamination from this cloud of inaccurate information does not drift too far.

John Hatcher
Nuclear Diving Service
Houston, TX

Conch or Not?

I have studied and appreciated molluscs for some years, and I also enjoy the edible aspects of the Queen Conch ("Edible Sea," Spring 1979).

This gastropod is one of 52 species of the family *Strombidae*. Members of this group are herbivorous and feed on algae. The Queen Conch in particular feeds on a type of red algae and is therefore found most often in colonies grazing sand flats and eel grass rich in algae. The conch the author may have observed "engulfing its victim" could very likely have been a helmet shell, *Cassidae*. These are predatory molluscs which feed on echinoderms.

Frances Ring
San Francisco, CA

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THE MAIL continued

Using a knife to remove a conch leaves a hole in the shell, which is a pity from the collector's point of view. An old fisherman in South Caicos told me of a better way.

Suspend the conch, lip down, between two rocks of a size that won't quite let the conch's foot reach the ground. When the conch emerges, grab him and pull *hard*. This quick maneuver is made easier if you first rub a damp hand in sand to provide a grip of the slippery creature.

Audrey Semple
Grenada, West Indies

If You Get Bent, Do It in St. Pete

Thank you, Dr. Bassett ("We Need More Trained Physicians," Spring 1979). As a sport diver, M.D., and member of the Undersea Medical Society, I am very interested in eliminating problems you speak of. One way is to educate divers as to where doctors competent in the field of diving medicine practice.

Our area has three such physicians. Besides myself, William Beel, M.D., practices at Morton Plant Hospital and Neal Frankle, M.D., practices at Bayfront Medical Center.

Richard F. Johnson, M.D.
St. Petersburg, FL

California Divers

I got a good chuckle out of Tim Cahill's article on California divers (Summer 1979.) I've been diving Florida and the Caribbean for a number of years and I have to agree that California divers are indeed unique.

They always seem to be able to swim farther, stay down longer, dive deeper and stand colder water.

They enjoy showing up for a Caribbean night dive in a wet Hang Ten bathing suit and snickering at everyone who's wearing neoprene.

They're easy to recognize too. On the first dive of the day, the California diver is the one wearing a shark dart, bang stick, seven stainless steel knives, a machete and great huge fins with metal supports that run up the legs and attach to the calf muscle and knee caps.

On the second dive he'll be the one lying flat on the deck sea sick as you pick your way around him.

Colonel Will Young
Bellevue, KY

Tim Cahill says that he has never taken a machete underwater and he only wears six knives—Ed.

continued



"45 FEET DOWN, DIVING FOR LOBSTER OFF ANACAPA ISLAND, SUDDENLY I HEARD..."

... my buddy transmitting over his SPORT-PHONE™ Diver C.B. He was about 40 feet behind me and out of sight, but the message came through loud and clear. 'Get over here,' he said. I transmitted back, 'What did you find?' 'Dinner for six!' 'Say again?' 'The Loch Ness lobster.' 'On my way.' When I reached him, Dave was hovering in front of a crevice. 'It's a big bull... got himself stuck in there.' I could see the bug's feelers waving just inside the crevice. If Dave tried pulling the feelers, the bug would just shed them. Dave said, 'Any ideas?' 'Reach in and push him,' I said. 'Okay.' 'And watch out for morays.' 'Thanks.' Pushing the bug freed its locked-in spines. A moment later he was in the goodie bag. 'Let's mark this spot... come back for more tomorrow.' 'Roger.' I secured my WET-BEACON™ to the crevice, then we headed for the surface.

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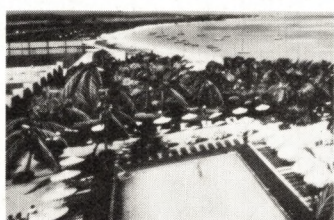
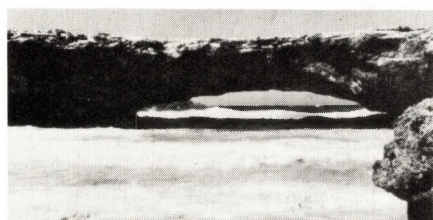
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For brochures, hotel information and rates, write to: Aruba Tourist Bureau, Dept. SD-58, 1270 Ave. of the Americas, New York, New York 10020

THE MAIL *continued*

The Deaf Did It

I would like to thank Bob Landers ("A New Language for Divers," Fall 1978) for having the courage and being willing to take the extra effort to teach the deaf to dive.

A fellow teacher here at the Katzenbach School for the Deaf found an article in a 1961 issue of *All Hands*, a U.S. Navy publication, which contained information about hand signs being taught to Navy divers at the Underwater Swimmers School in Key West. The use of signs is also being taught as part of the YMCA's Search and Recovery Program.

Credit for improved underwater communications through the use of signs should go to the deaf divers of the world, not to NAUI or any other agency.

Peter Slaton
West Trenton, NJ

For Better or Worse

After I recovered from my initial amazement at *Sport Diver's* new look (Spring 1979), I renewed my subscription for two years.

Your previous format was the best looking I'd ever seen in a dive magazine, and this new design is just too much. You've managed to retain the dynamic photography and crisp writing style that have held my attention for years while presenting it in a new, clean and very tasteful manner. Diving is a dramatic experience, and the sport deserves a high-caliber journal of the superior quality you've now attained.

Is there another dive magazine? Not for my money.

William Sanders
Chicago, IL

Did your enlarger break? The photographs in the Spring 1979 issue were so small. I was shocked when I opened the magazine only to be met with page after page of plain white paper with little snapshots scattered over them. Even the cover wasn't a full page photograph. I realize you've changed publishers and some things are going to be different, but please don't sacrifice the graphic portion of your magazine for a few extra pages of print.

The literary content of the Spring issue was very good as usual, and the quality of the photography was excellent even if I had to squint to see all the detail.

Raymond Powers
Pensacola, FL

For a nominal fee we'd be willing to bind a magnifier into your next copy —Ed. ☺

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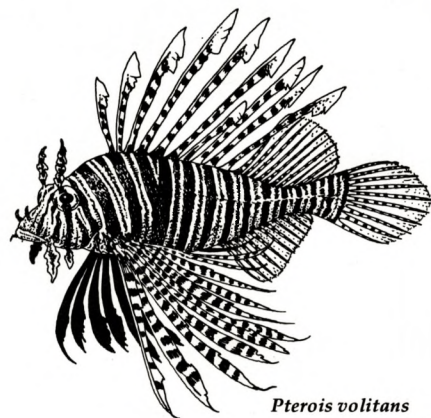


Dealers Invited!

Richard Ellis

What's in a name?

Browsing the shelves of a second hand bookstore recently, I came across R. W. Brown's *Composition of Scientific Words*. Since my work often involves the use of these sometimes cumbersome terms, I was eager to obtain the book and put it to use. Organized like a dictionary, this amazing little book packs the volume of an encyclopedia, bursting with fascinating cross-references opening up an intriguing new world of etymological insights. I'd like to introduce you to some of the subtleties and pleasures of



Pterois volitans

this often misunderstood but vitally important area of scientific study.

There is an animal in Australian waters known as the butterfly cod. In South Africa it is called the fireworks fish or stonefish, and in various other locations the same creature is known as lionfish, turkeyfish or zebrafish. From this list it would be possible to deduce that this is a rather showy creature, but that is probably all the information you could draw from these common names. It is probably safe to assume that no fish can simultaneously resemble a lion, butterfly, turkey, stone and zebra. Obviously, one could never be sure if

Richard Ellis is a writer and illustrator whose world is natural history. His illustrations have appeared, among other places, in Reader's Digest, Audubon, Sport Diver and the new edition of the Encyclopedia Britannica. Ellis is also author of the Book of Sharks.

the Australian who called his specimen a butterfly cod was talking about the lionfish a Red Sea diver had seen. But if they had referred to *Pterois volitans*, there would have been no question about the identification of the fish. And here's where Brown's book comes in handy: *Pterois volitans* means "winged flyer" from the Greek *pteros*, meaning "wing" and the Latin *volare*, "to fly." Wherever it is encountered and no matter what you call it in English, French or Zulu, this fish is *Pterois volitans*.

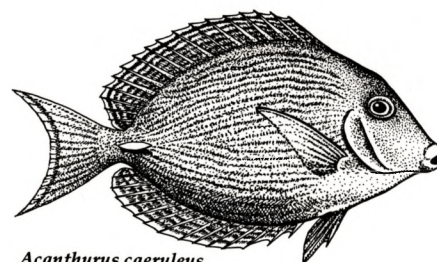
Every living thing has a scientific name. The name is divided into two parts, known respectively as the generic and the specific name. This two-part arrangement is known as binomial nomenclature. The system was invented by a Swede, Karl von Linne, whose name became Carolus Linnaeus in Latin, a language he favored for more accurate identification since it was understood, more or less, by all 18th century scholars and scientists. Linnaeus was a botanist, and his first efforts were classification of the plants of Lapland (*Flora Laponica*, 1737). But eventually his system was applied to animals as well, and his system for plant and animal classification is still in use today. He even classified minerals binomially, but the application was not universally accepted.

In pre-Linnaean days—that is, before 1758 when the tenth edition of his *Systema Naturae* was published—scholars called animals almost anything they wanted to. The result was nomenclatural chaos. Also, it is important to remember that 1758 was pre-Darwin, so it was not only the names of the animals that were chaotic, but also their relationships and purpose. No animal could be identified correctly, and names differed radically from country to country. The Linnaean system, still being revised and amended, has made it possible for scientists to know with certainty that they are talking about the same animal. Even in countries where other alphabets are used, such as Japan and Russia, the scientific name is reproduced just as you see it here: *Pterois volitans*.

The naming of animals is part of the larger science of taxonomy (from the Greek *taxo*, "to arrange"), which is concerned with the classification of all living things. Every animal has a binomial. Your dog, no matter what breed, may be named Spot, Rover or Ozymandias, but he is *Canis familiaris* nonetheless.

Linnaeus himself named many of the species that were known to him in the 18th century (he died in 1778), but there have been a great many animals discovered since then. In an earlier column (Spring 1979), I briefly discussed the naming of the long-lost coelacanth, *Latimeria chalumnae*. I now propose to venture gingerly into the not-so-mysterious world of contemporary nomenclature. Most names are fairly straightforward, referring to some obvious physical characteristic, location or person to be honored by naming the animal for him. The infinite variety of names applies of course to all living things, but here I will restrict myself to a discussion of fishes.

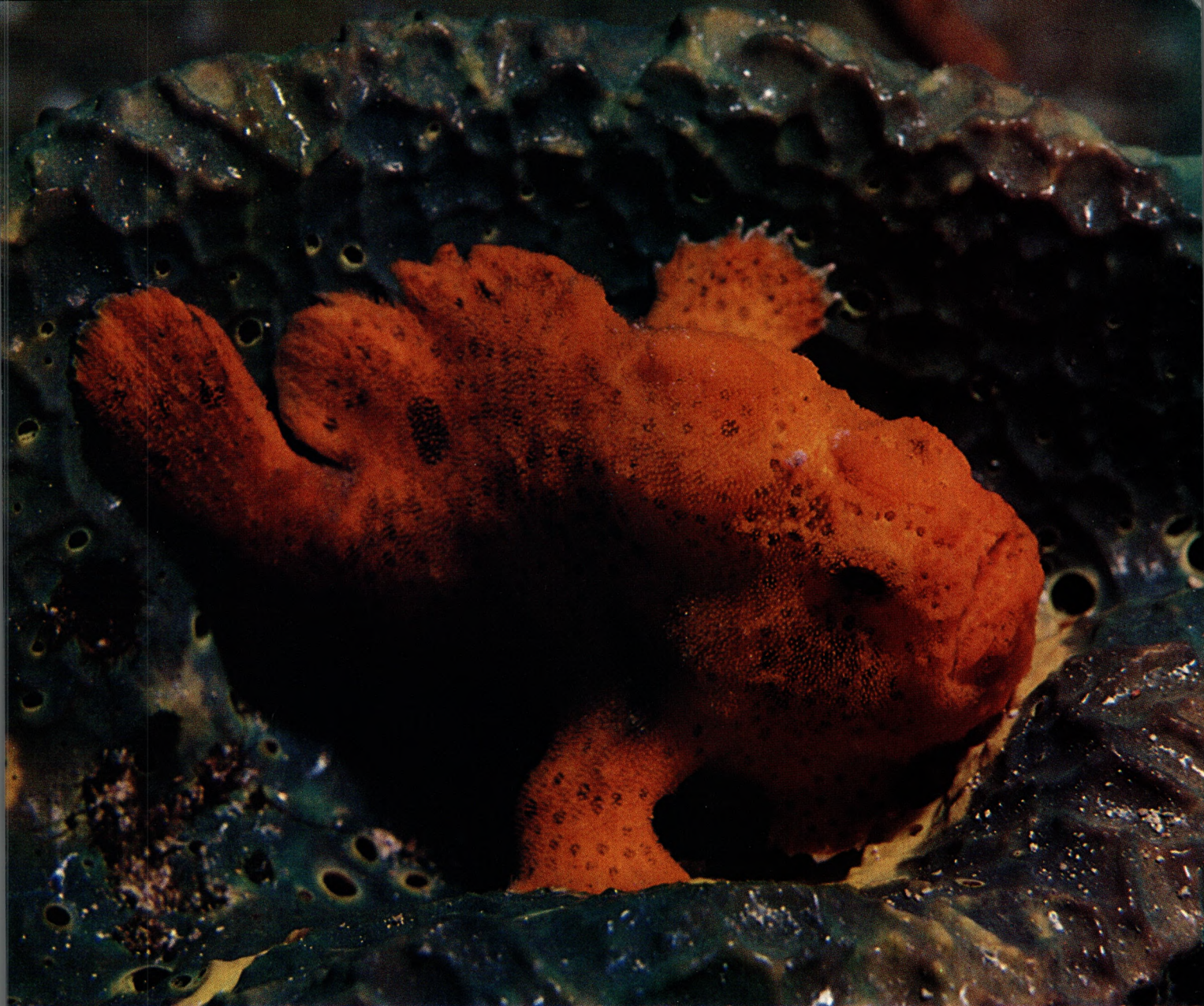
Surgeonfish belong to the genus



Acanthurus caeruleus

Acanthurus, which comes from the Greek *acantha*, meaning "prickle" or "spine." This refers to the scalpel-like spine at the base of this creature's tail. This spine accounts for the common names of surgeonfish, and it should be noted that only the generic name is capitalized; the specific name never is, even if it is based on a proper noun. There is *Acanthurus caeruleus*, the blue tang (*caeruleus* means "blue"); *Acanthurus chirugus*, from the same root as "surgeon"; *Acanthurus sandwicensis*, from the Sandwich Islands (Hawaii); *Acanthurus guttatus*, "spotted"; and *Acanthurus xanthopterus*, from *xan-*

continued



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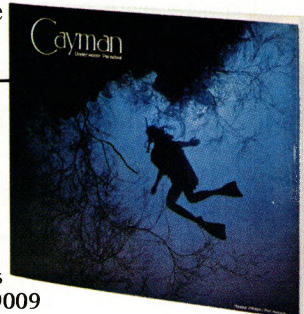
At last, here is a stunningly beautiful book on the underwater life of the Cayman Islands. Feodor Pitcairn and Paul Humann (Captain of the M/V Cayman Diver) have collaborated in producing this definitive work, featuring more than 70 full color photographs of underwater scenes. From tiny invertebrates to giant jewfish, this book contains the full range of marine organisms (some rarely seen) found on these amazing reefs.

Captain Humann shares with the reader his intimate knowledge of the three Cayman Islands, acquired during his more than 3,000 dives. Complete with accompanying maps, this book discusses in detail the great diving spots to be found at Cayman.

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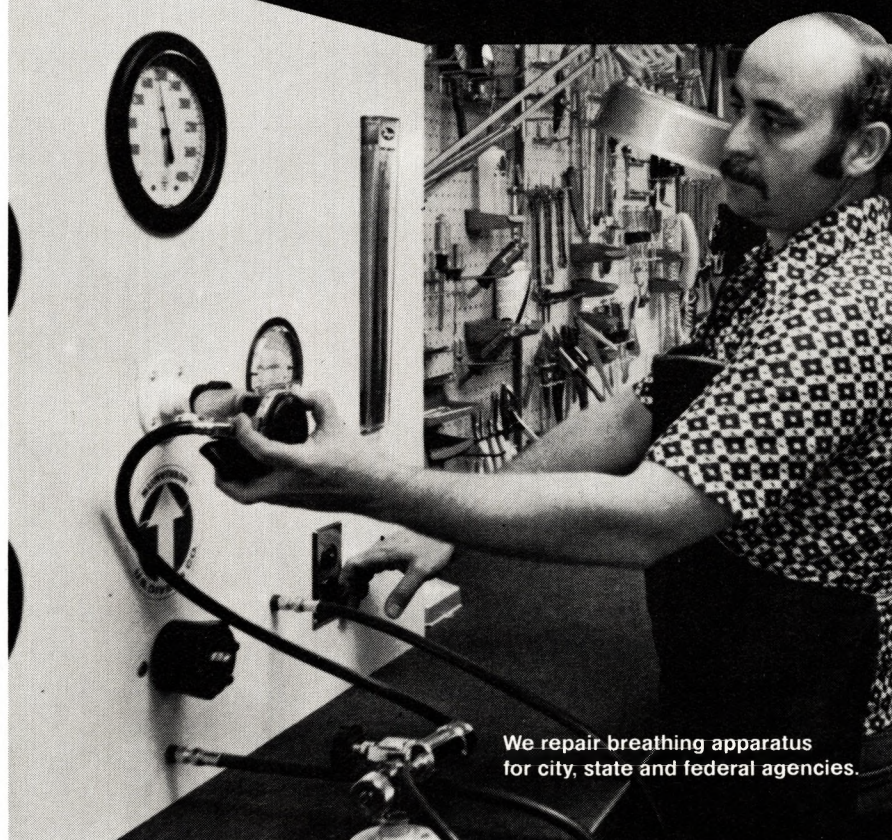
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RICHARD ELLIS *continued*

thos, "yellow" and *pteron*, "wing" or "fin." Other species in the genus are named for people (*Acanthurus thompsoni* and *Acanthurus dussumieri*), and one is even named for a mythological hero, *Acanthurus achilles*. In Hawaiian waters, where many of these species are found, these fishes are known variously as *palani*, *manini* or *paku'iku'i*. It should be apparent that scientific names are extremely useful in positive identification.

But how does a fish get a name like *Acanthurus xanthopterus*? If and when a species is discovered that appears to differ from all others, the discoverer examines as many similar specimens as possible for comparison and, if he believes that his specimen is indeed new, he begins to choose a name. According to the rules of the International Code of Zoological Nomenclature, no two genera may have the same name. (The plural form of genus is genera, but the plural form of species is species. Species is coined money and has nothing to do with the naming of animals.) But because specific names are often descriptive, a certain amount of repetition can't be avoided. *Fuscus*, meaning "dark" or "dusky" (from which we get such words as "obfuscate"), is the last name of a triggerfish, *Balistes fuscus*; a damselfish, *Eupomacentrus fuscus*; a goby, *Bathygobius fuscus*; and an Australian fish known as the dusky flathead, *Platycephalus fuscus*. This last is an almost literal transliteration: *Platy* means "flat," and *cephalos* means "head."

When the selected name has been approved by the ICZN, the ichthyologist then writes a complete description of the new species which must be published in a recognized scientific journal. The date of publication and the name of the scientist then become part of the animal's full name: *Acanthurus caeruleus* Bloch and Schneider, 1801. Linnaeus' name is appended to more binomials than any other individual's, since his 1758 *Systema Naturae* codified and named all the animals that were known in 1758.

Therefore, in addition to the first, middle and last names on your birth certificate, you can take pride in your scientific name, *Homo sapiens* Linnaeus, 1758. The word *homo* means "man," and *sapiens* means "wise" or "knowing," a reference to our ability to classify all the other creatures, if not necessarily to protect or understand them. ☺

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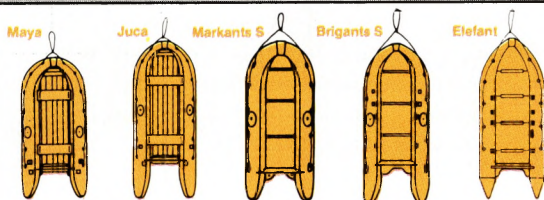
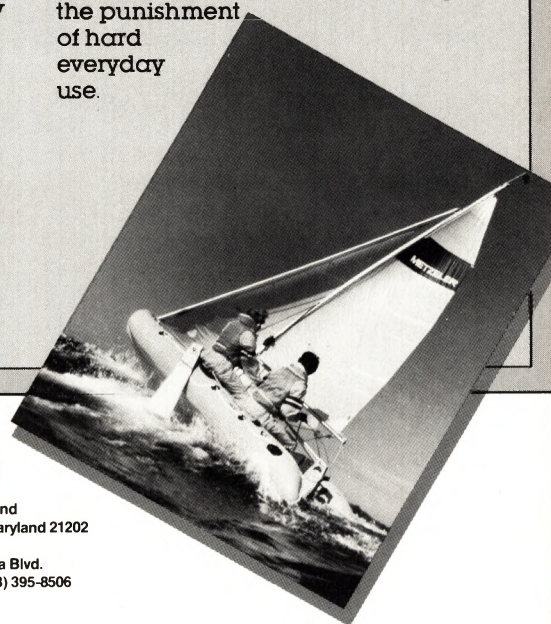
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Lowell Weicker

Rejuvenating our coastal waters.

For most of us, the temptation to stop by the seashore and gaze into the eyes of the sea is strong.

Almost all of our contact with the ocean occurs where the shore and the coastal waters meet. It is where we fish, swim, boat or relax; perhaps daydreaming and washing our souls of terrestrial problems.

The coastal waters are profoundly important to our country. They are used by most of the 20 million recreational marine fishermen. Commercial fishermen harvest oysters, clams, crabs and many species of fish from the near shore oceans, amounting to three fifths of all fish caught commercially in the U.S. If we add the total estimated recreational catch to the near-shore commercial catch, roughly two thirds of all fish caught are brought in within three miles of the coast.

Adding the enormous recreational and dollar value of swimming, boating and sport diving underscores the critical significance of coastal waters to the economy of the country.

Some 400 years ago, before the arrival of white men in North America, the coasts were alive with marine life and most estuaries were clean and relatively free of suspended materials. As population increased and forests gave way to farm land, the rain brought mud and silt from the unprotected land to the rivers and coastal sea.

By the turn of the century the pattern of farm land was set, but new threats came: large scale construction and disposal of industrial wastes.

The population growth and increased wealth of the nation demanded more and more goods: chemicals, energy, houses and food. Pesticides became important to sustain the phenomenal productivity of the American farmer.

The 20th century has brought even

higher living standards to our people, but now we may be on the threshold of paying the price. Increased waste production without environmental monitoring has become a ghastly specter threatening our health, economy and, ultimately, our life style.

The detrimental effects of dumping sewage and chemicals into rivers and estuarine systems is well documented, but what of the oceans, particularly our coastal waters?

For years the opinion of laymen and scientists alike was that the vast oceans cannot be polluted or fundamentally changed by man's activities. After all, man is not capable of doing anything of consequence to an environment so big and so dynamic as the sea.

*Our most profound
problems are the lack of
basic research
and an effective coastal
monitoring program.*

I have personally seen reefs off the Bahamas and the Virgin Islands where the corals were affected by runoff from nearby construction.

Diving has brought me to the beauty of the reefs, but it has also shown me how easily they can be destroyed.

I believe that man's detrimental impact on coastal waters is widespread, perhaps universal. The international concern for environmental protection expressed at the Law of the Sea Conference, for instance, reflects the global fear of degradation of the oceans.

On the brighter side, laws have been passed during the past decade which deal with protection of the sea. Laws such as the Coastal Zone Management Act; The Fisheries Conservation and Management Act that established the 200 mile fisheries zone; The Marine Protection, Research and Sanc-

tuaries Act; and most recently, the National Ocean Pollution Research and Development Monitoring Planning Act of 1978, have specific and far reaching purposes to protect our marine environment. Unfortunately, we have far to go before we can be sure the oceans will not be further degraded and before the downward trend can be reversed.

The key problem is a lack of solid long term studies to determine what effect we are having on coastal waters. Much of the federal research is short term, and responsive only to old, highly visible problems.

There is little monitoring of the basic physical parameters of coastal waters such as temperature, salinity, currents and dissolved oxygen. Instability of any of these would have profound effects on the survival of most marine species. Without a monitoring program to track the natural processes of the oceans, we have little knowledge of its movements and changes.

Mass mortalities of bottom dwelling fish off Long Island, New Jersey and Delaware during the summer of 1976 were discovered only through the alertness of a few sport divers; scientists had no idea what was happening. The dissolved oxygen in bottom water fell below the level needed to sustain life. One result was that an estimated 143,000 tons of surf clam meat was lost. This figure represents 69 per cent of the total surf clam population off New Jersey.

Scientists were only able to react to the problem after the fact. An ongoing monitoring program could have helped them trace the origins and possible causes of the low oxygen levels.

This is only one example of the many problems we now have. Understanding, protecting and improving our coastal waters is a first order of business for all of us. Congress, the Administration, State and local governments, fishermen, boaters, and divers must insist that strong laws against pollution of coastal waters and increased scientific studies be part of our future. ☺

Senator Lowell Weicker (R.-Conn.) is a concerned diver who has spent time in the Hydro-Lab. He is also a member of the Marine Resources Committee of the U.S. Senate.

A black and orange Scubamaster snorkel is positioned diagonally across the frame. A clear, wide-angle dive mask with a black frame and a large, curved lens is placed in front of the snorkel. The mask's lens is slightly tilted, showing a reflection of the snorkel. The background is a solid, deep blue. The overall composition is clean and professional, highlighting the diving equipment.

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Dick Anderson

The Captain's parrot.

Thousands of people have parrots. Most parrots just sit around for 40 years and do nothing but convert sunflower seeds to fertilizer. But put a parrot in the hands of someone like Glenn Miller and you can bet you won't have to wait 40 years for some action.

Having been in the charter business in Santa Barbara for many years, nothing Captain Glenn does is predictable by any established standard.

Glenn's real pride was a turkey-sized macaw named Fred. Glenn flew in from Hawaii one night and asked me to pick him up. Fred was with him. Glenn had bought Fred in Honolulu with ten dollars down and \$290 on his American Express card. Fred couldn't talk but Glenn also had a teach-your-parrot-to-talk record that guaranteed an instant fowl vocabulary.

When we got to my house Glenn put Fred up on one of the cross beams in the living room. I offered immediate protest. I mean, the carpet was new—and expensive. And Fred looked like a large-capacity parrot. I told Glenn I didn't want Fred excreting on the floor.

Glenn was shocked and a little insulted by my concern. He said, "Dick, I swear to God, this parrot doesn't excrete. I've had him for three days and I swear to God he just doesn't."

Was I to believe Glenn Miller had the world's only closed-circuit parrot? While I was spreading out the L.A. Times to cover the carpet within Fred's firing range, Glenn protested. "Dick, it's a waste of time. Fred really doesn't..." Squirt. Splat. Even in light of this new and compelling evidence, Glenn stuck by his story. "I swear to God, Dick, that's the first time he ever did that."

By this time Glenn had started playing his teach-your-parrot-to-talk record. This Fred ignored but it got a great reaction from my dog, Igor. He barked himself into a canine frenzy. At

the end of Fred's first speaking class he could bark well enough to fool Igor.

Within a couple more hours Fred learned a word. "Eeeeeegorrrr." This got an even better response from Igor. Fred really got a kick out of calling Igor over near his perch, then barking at him. The next morning Igor was hoarse and in need of group therapy.

Glenn took Fred back home to Santa Barbara and went about his captaining business. I called about a week later. Glenn told me that Fred could bark



better than Mac, his dog. "And he can say his name," Glenn added with evident pride.

"You've taught him to say 'Fred'?"

"No," Glenn replied, "I changed his name to Igor."

Encouraged, Glenn decided to give Fred a saturation speech course. Leaving for a weekend charter, Glenn put on his parrot record and set up the turntable to repeat. All day Saturday and Sunday Glenn envisioned returning home and having a lengthy conversation with Fred.

When he got home he had two surprises. The record player had stuck on reject, and Fred was practicing saying "ssssss-click-ssssss-click-ssssss-click..."

Glenn's second surprise came when he looked at his expensive new overstuffed leather desk chair. Fred had pulled out hundreds of shiny brass upholstery tacks, reduced the chair's stuffing to a snowy pile of bite-sized chunks and defiled the whole mess.

By the next weekend, Fred had done so much damage Glenn decided to lock him in the spare bedroom while

he was gone. On the way home that evening Glenn stopped to pick up a 50-pound bag of raw peanuts he had ordered for Fred. When he got home the place looked like it was under siege.

Exploding ammunition cracked through the night and smoke poured from the windows. The air was alive with hot slugs and shredded shell casings. Using a trash can lid as a shield, Glenn stormed the door and charged inside with a garden hose. He was met by dense smoke and a barrage of flying shrapnel. Too late he remembered the 50-pound box of shotgun shells, .22s, .44 magnums and 9mm Luger shells he had stashed in the spare bedroom. Glenn hosed down the box and assessed the damages.

The windows were already pretty well ventilated, matching the pock-marked walls and ceiling, and the smoke began to clear. Fred was huddled in a corner. He had found a box of wooden matches irresistible. Glenn called me a few minutes later.

"He's dead," Glenn said.

"Did you try giving him mouth-to-mouth resuscitation?"

"Sure. That's the first thing I did. He bit a hole clear through my lip."

Glenn was lisping and sounded really despondent. "God, Dick, it's going to cost me 500 bucks to fix up the bedroom and I still owe almost \$300 on Fred. What am I going to do?"

Now, I'm not one to trod on a friend's sensitivities, but we were talking about a very expensive bird. "Toss the sonofabitch in the deep freeze and we'll eat him the next time I come up there. Then we'll have the skin stuffed and mounted." If Roy Rogers could stuff Trigger, Fred should be no problem.

I thought Glenn had hung up on me, but he explained later he had to drop the phone because Mac had chased a skunk into the dining room. Never a dull moment around Glenn. He's the only guy I know who has a 50-pound bag of raw peanuts for a thousand dollar parrot that never eats. ☺

Dick Anderson is a freelance wit whose absurdities were last viewed by readers in Aquarius Magazine.



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Letter From

...Thailand.

BY SAUL LOCKHART

Barely 600 miles north of the Equator, where the South China Sea reaches north to become the Gulf of Siam, the diving is legendary. Just offshore from the Thailand resort town of Pattaya, clear tropical waters offer placid coral islands, bizarre Indochinese tropicals and the elusive promise of 600-year-old pottery scattered among the remains of ancient trading vessels.

Pattaya offers a startling diversity of activities. Being Asia's largest, most popular and probably most efficient resort, Pattaya Beach caters to everyone. Fantastic coral islands and shallow wrecks can be dived in day trips, the boat returning to the evening glow of hotels with all the standard conveniences.

Whether you're a family with the kids in tow or just a couple of bachelors (of either sex), Pattaya offers a full round of resort activities: Incomparable seafood, a good bar/disco scene, massage parlors, parasailing, wind surfing, water skiing, horseback riding and even elephant riding.

Having everything arranged by the dive shops, whether for a day trip just offshore or a longer sojourn from one of the fishing villages down the coast, means less hassles and more dive time. You can rent anything from full outfits to supplementary items such as cameras or extra weights.

My first dives were on the islands just off Pattaya, the nearest three being Ko ("island" in Thai) Sak, Ko Krok and Ko Lan. Boats for these islands, and the six further out, depart from the beach near the dive shops. These boats, usually converted Thai fishing vessels, carry ice; cold drinks and fruit can be bought from vendors along the beach road.

These three islands have been stripped of shells and you won't see many large fish, but the coral is worth the

dive. Beautiful formations off the southern end of Ko Lan and north of Ko Sak lie in less than 30 feet of water. Visibility can reach 60 feet. Due west of Lan is Ko Phai. Farther from the mainland, Phai offers a wider variety of marine life and coral formations in 20 to 100 feet of water. Ko Rin, to the southwest, has some of the best dive sites in the nearer islands. Here you're likely to see larger pelagic fish rarely disturbed by divers, as well as spectacular shallow coral formations. Currents at Rin can be strong,



so check the tide tables and shoot for the slack tide.

If you bring your own equipment, it is possible to dive less crowded and more virgin territory along the coast. Si Chang Island and its neighbors lie 30 minutes by boat from the fishing village of Si Racha, 60 miles southeast of Bangkok. Piles from an old fueling station on the eastern side act as magnets for countless Indochinese tropicals, corals and sponges. Wreck divers can empty several tanks exploring the many World War II ships growing corals along the bottom off Si Chang.

About 20 miles south of Pattaya is a modern beach resort, the Bang Saray Fishing and Country Club. Boats rented from the club can put you in the water near Ko Klet Kaeo or Ko Khram Yai for excellent coral diving. South of Bang Saray the tiny fishing *ban* (village) of Sa-Mae San offers choice coral and the

chance to sift bottom sands for ancient porcelain at the site of a 600-year-old Chinese wreck.

Normally, traveling to a tiny fishing village well away from the tourist areas would entail problems of organization. But Doc Welch, a former American Air Force officer who retired to a nearby village a decade ago, can arrange everything. With the logistics knocked, visiting divers can concentrate on enjoying the marine scenery.

Off Ko Chuang, about an hour from Ban Sa-Mae San, is the wreck of the Thai coastal vessel *Hadib*. A boil of water on the surface marks its position, but that boil means the tide is running. The *Hadib*, a 240-foot vessel captured by the Japanese during World War II, was sunk by the Americans in shallow water. Today it lies in the sand on its starboard side. Large shell holes in the engine room and forecastle give easy access to the ship's interior.

Significantly older and harder to find is the pottery wreck, named for a load of Chinese porcelain the 500-year-old junk carried with her to the sandy bottom. Lying east of the Sa-Mae San Channel, the site is fairly well picked over, but shards of ancient porcelain still abound. Tides and currents here can be fierce, so take heed of your dive guide's advice.

All told, diving in Pattaya is as easily arranged as your trip to Thailand. In fact, at least one of the international hotels, the Holiday Inn Sands in Pattaya, offers a diving package with six nights' accommodation with breakfast and cocktail, lunch; five days of diving by boat for ten single tank dives with American PADI instructors; a free T-shirt; and one free sauna. If the U.S. Holiday Inn system can't give you booking information, have your travel agent contact the Holiday Inn Sales Office, Koongboonma Building, Silom Road, Bangkok.

Bring as much or as little as you like, and come prepared to stay because you may not want to leave. Just ask Doc Welch.

Saul Lockhart is author of *The Diver's Guide to Asian Waters*. This is his first contribution to *Sport Diver*.

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Letter From

...Washington.

BY PHIL TRUPP

A famous treasure hunter once took me aside and with an air of immense secrecy handed me a Spanish gold coin. He invited me to admire its beauty. He pointed to the date: 1617. The coin had been underwater a long time.

"Now that's treasure," he said.

It was lovely, of course, and apparently the real thing. But I was shocked when he said it was worth nearly \$2000. I certainly wouldn't have paid it. After all, the value of treasure is born in the seer and it was not born in me that day.

I haven't a clue as to what became of the coin. I assume it went on the black market. Maybe an Arab oil sheik made it into a tie tack.

Many people say that's fine. Treasure hunters must make a living too. Besides, there are many more coins where that one came from. But a small number of people see it another way. These people feel a sense of loss. They believe that before treasure is sold to private collectors it should be shown to archaeologists and historians. The advocates of this position want to share in the find. They aren't concerned with profit. Instead, they are keenly interested in the historic value of the coin and what can be learned from it.

This is precisely the position of Charles M. McKinney, the man at the heart of a controversy over what to do about sunken treasure on the outer continental shelf and in state waters.

As manager of the U.S. Interior Department's antiquities program McKinney wants to stem the wholesale loss of history to the black market. His goal is to uncover the past and let the rest of us have a look at it.

His many detractors say he is a villain—a bureaucratic Rasputin. But the image of Charles M. McKinney the

Monster just won't wash.

At 38, McKinney is a reasonable man who gives the impression he'd rather be in the field with his fellow archaeologists instead of sitting behind a desk in Washington. He is unassuming, even shy at times. He wears dark suits and functional neckties. You wouldn't stop to notice him in a crowd. He is not a political appointee and his office is untouched by scandal. Whatever McKinney may be, he is not a crook.

Last year he took on Mel Fisher,

*McKinney's life
has been threatened twice
by divers opposed
to his historic shipwreck
preservation plan.*

president of Treasure Salvors, Inc., in a battle for possession of the Spanish treasure wreck, *Nuestra Senora d'Atocha*. Fisher won in an appeals court and made it to the pages of *Time* magazine. But McKinney continued to raise unsettling questions.

Of course Fisher found the *Atocha* and rightly deserved to profit by it. But McKinney wanted to know why Fisher should get it all. He wasn't talking about money. McKinney viewed the *Atocha* as a part of history—a storehouse of secrets. Before any profit-taking those secrets should have been unlocked. It was almost criminal to sacrifice them to the air lift.

After the *Atocha* fiasco McKinney toured the country lobbying for his position. He spoke to divers, archaeologists, treasure hunters and conservationists. He made a few friends, but mostly he made enemies.

Professional treasure hunters were angry. They believed McKinney intended to run them out of business.

Archaeologists, clannish by nature, were appalled. They said McKinney's

notion that sunken treasure be shared by the public was a giveaway of their exclusive turf.

Divers were loud and a little frightening. They said McKinney wasn't a diver (capital D) and couldn't possibly have anything to say about sunken treasure. Ironically, when he was a Marine assigned to north Africa he spent two years diving a sunken Roman dig as a professional archaeologist. To argue that he isn't qualified to shape a program of historical preservation is a little like saying Dr. Werner von Braun couldn't contribute to the space program because he wasn't an astronaut.

McKinney finds it puzzling that divers who are sensitive to ecological matters respond so violently to the idea of historic preservation. The attitude is typified by the following letter he received in April: "...Treasure hunters are entrepreneurs, Mr. McKinney, not bureaucratic robots. They have the guts and ambition to do what you would never do. They don't depend on 'Uncle Sam' to payroll them or provide a nice, fat pension."

This letter doesn't seem so bad when you consider that McKinney has received two anonymous death threats in the past year.

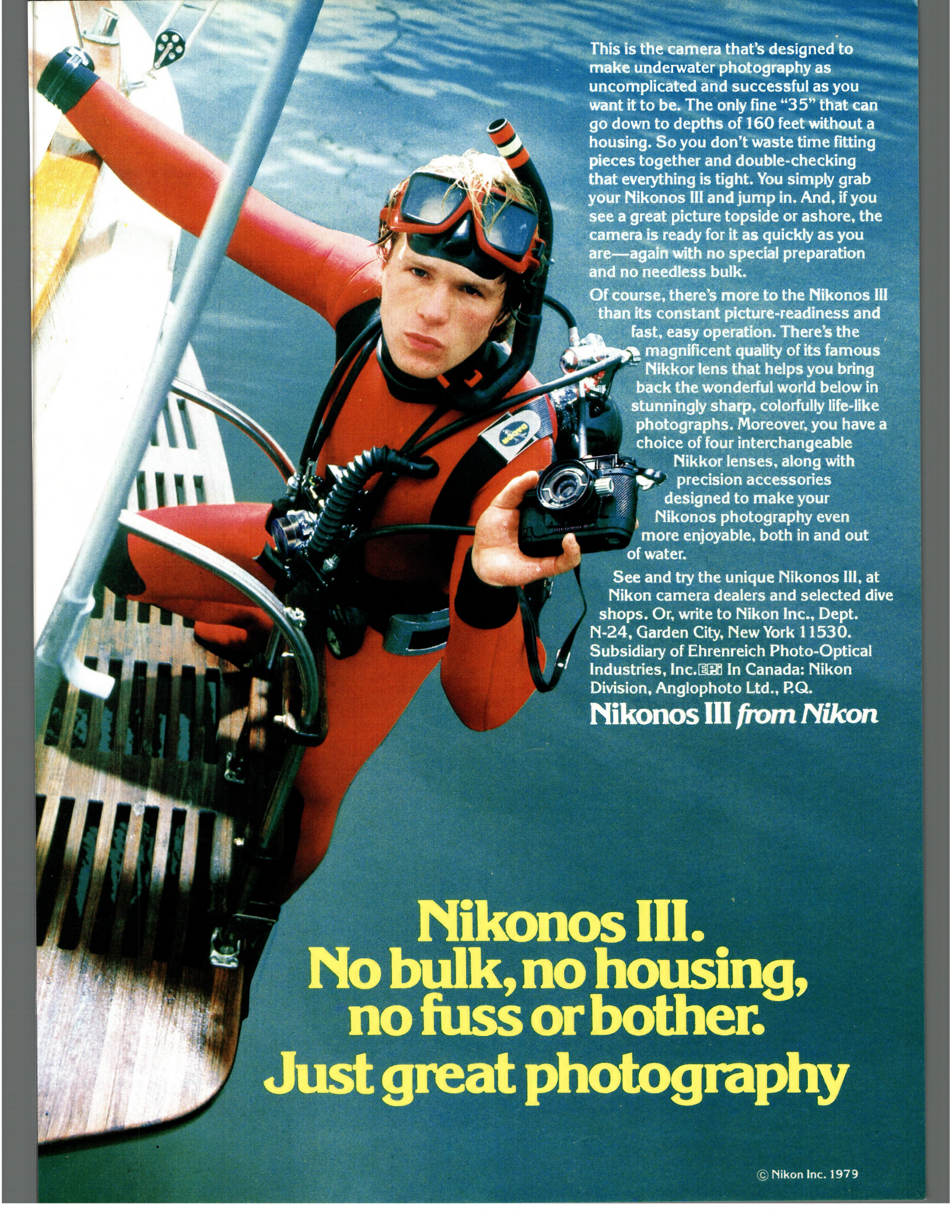
Still he keeps on going. As for his government pension, he may never collect it. His superiors in government have made it known they don't enjoy controversy—not at all. McKinney told them it couldn't be helped, and if Interior kicked him up, down or sideways on the treasure issue he'd resign.

These days one finds McKinney in downtown Washington marking up a bill known as House Resolution 1195. In the broadest sense H.R. 1195 describes a national policy on the handling and disposition of sunken treasure. But before explaining the details McKinney gives a visitor a grass roots feel for the overriding issue.

Every weekend, he says, many families wake up, read the comics and spend the rest of the day robbing graves.

Phil Trupp is Sport Diver's Washington connection. An experienced author and diver, Phil has spent 20 years covering the Washington scene for major publications.

continued

A full-page photograph of a male diver in a red wetsuit and black mask with orange accents. He is holding a Nikonos III camera in his right hand. He is standing on the wooden deck of a boat, with a white railing and a blue sky in the background.

This is the camera that's designed to make underwater photography as uncomplicated and successful as you want it to be. The only fine "35" that can go down to depths of 160 feet without a housing. So you don't waste time fitting pieces together and double-checking that everything is tight. You simply grab your Nikonos III and jump in. And, if you see a great picture topside or ashore, the camera is ready for it as quickly as you are—again with no special preparation and no needless bulk.

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WASHINGTON *continued*

It happens both on land and in the ocean. Ripping off artifacts and wholesale defacement is a sport to some people. We may call it fun, but in a country like Saudi Arabia you'd lose your fingers if you were caught.

"Too many people just aren't aware of their cultural heritage," McKinney says. "I respect my colleagues, but they just haven't reached out to people the way they should."

Some states try their own preservation programs. In McKinney's home state of Texas, a diver finding a gold coin must turn it over to recognized authorities.

Florida keeps 25 percent of whatever a treasure hunter brings up. In South Carolina, however, a diver may keep his finds after they've been documented and studied.

In certain ways H.R. 1195 comes close to South Carolina's hobbyist system. With a few changes, McKinney believes we can live with it.

When the resolution was introduced to Congress in January by Florida Democrat Charles E. Bennett it didn't stand a chance. It gave absolute authority to the Secretary of the Interior to claim title to wrecks on the outer continental shelf and in state waters. This was a direct slap at the sensitive issue of states' rights. It empowered the federal government to hold the property until the various states proved they were willing and able to oversee their artifacts.

McKinney had to do some major surgery to remove this fatal flaw. He has proposed that the federal government hold title only to *federally owned* vessels in state waters.

As for a definition of historic, H.R. 1195 uses an arbitrary time scale. In the present version of H.R. 1195, an historic vessel will be one that was 100 years old or more on the date the bill is passed. McKinney would cut that to 50 years. This covers Spanish galleons such as the *Atocha* but not sunken foreign warships like the German U-boat, *U-352*, down off the coast of North Carolina. Foreign ships remain in foreign hands.

McKinney has worded the bill to give Interior title and control of appropriate wrecks and the discretionary power to release relevant data to professional salvors who wish to excavate a selected site. However, the salvor must prove to be working in what McKinney calls the "best interests of the resource."

To satisfy this requirement the salvor must agree to join with a non-

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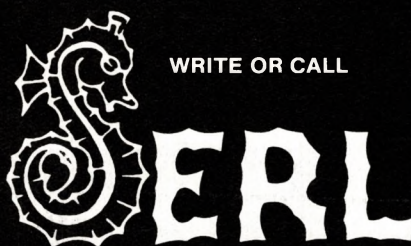
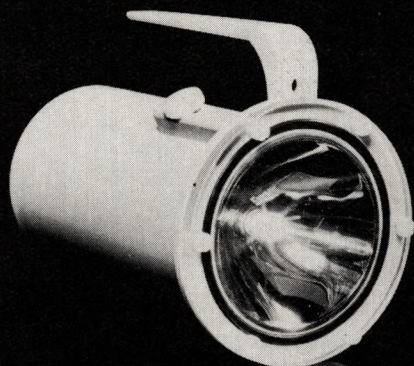
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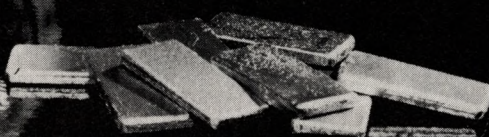
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WASHINGTON *continued*

who place the treasure hunter and the public in the same untouchable caste.

"Some state people absolutely refuse to do business with salvors," he says. "And as for the public's right to know, they could care less."

It is conceivable that H.R. 1195 will force state historians to recognize and take advantage of the knowledge treasure hunters possess. Perhaps they can join forces for a change and work together on behalf of the government and the taxpayer.

McKinney hopes to involve sport divers, too. The bill doesn't mention them and there is nothing to restrict their activities. For nearly two years he has said they have an important part to play. Divers have information and experience, and their contributions to a national effort may prove to be substantial.

But what about the professional treasure hunters—where do they stand today? McKinney believes they're ready to listen to reason.

He says Mel Fisher, who comes in for a good deal of McKinney's respect, understands the historical aspects of his profession and wants to do something about it.

"Mel realizes he can't do it alone," McKinney says. "But he can make it possible for others to be involved. He says he's ready to work with us."

The search for treasure isn't going to end. The government can't legislate this very human desire out of existence. But our lawmakers can do something about black marketeering, and they can find ways so that all of us can share the most significant part of any treasure trove—the insight into who we are and where we came from.

Washington Currents

Key Largo Discovery

A large virgin reef system has been charted by the National Oceanic and Atmospheric Administration within the boundaries of the Pennekamp underwater sanctuary at Key Largo.

Covering 40 square miles, the reef is in 120 feet of water with coral heads rising eight to ten feet from the bottom.

Also charted was evidence of a metal wreck estimated to be 175 feet long and rising 30 feet off the bottom.

The reef system and wreck were found March 26-30 by NOAA survey

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ship *Peirce* using side scan sonar and hydrographic instruments.

Phase II of the survey, which begins in June, will be a joint NOAA-Harbor Branch Foundation probe using divers and lock-out submersibles.

Sanctuary Operations Officer Lt. Ted Lillestolen said the area is near Molasses Reef Wall, where the bottom drops abruptly to 100 or more feet. Molasses Tower marks the southern limit with Turtle Reef Buoy on the north.

Lt. Lillestolen said the area appears to be virtually unexplored. The reef and wreck, six miles from Largo's Sound Point, are protected by the Marine Sanctuary Act.

The exploratory phase of the project will include study of the coral growth and the wreck, along with a preliminary inventory of marine species. Other possible wreck sites were traced by sonar and these, too, will be explored, Lt. Lillestolen said.

The long-run benefit is that a new area of Pennekamp will be charted, giving sport divers a chance to make their own discoveries.

Thirty-two Per Cent Solution

More good news from NOAA—dive tables which extend bottom time and cut down on decompression. The tables are based on a 32-per cent oxygen mix in the breathing gas. The air formula, being used for the first time with open circuit scuba, is called Nitrox-I.

Its higher oxygen content acts as a scrubber and reduces the normal 80-per cent nitrogen uptake. And because there is less nitrogen, lessened narcosis comes as a side benefit.

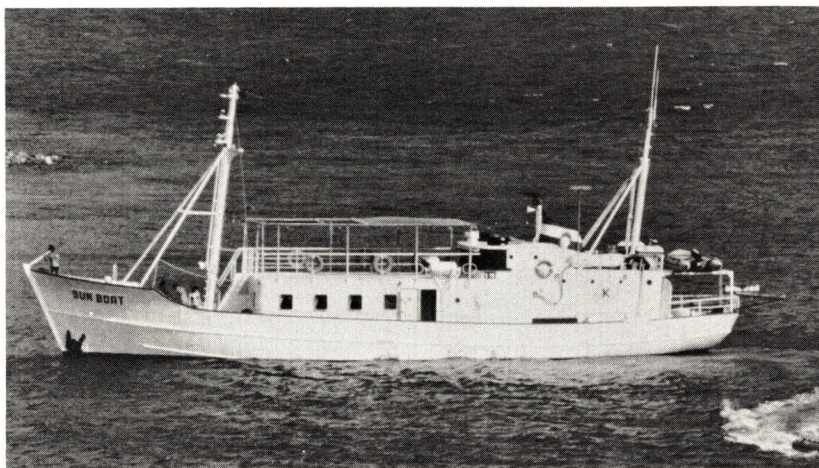
According to the author of the tables, Dr. J. Morgan Wells, Nitrox-I poses no problem of oxygen toxicity. Logically, decompression times are shorter than those suggested by the Navy because less nitrogen is absorbed by the body. Dr. Wells said the Nitrox tables were formulated more than a year ago and were tested at the Virginia Mason Hyperbaric Research Facility, Seattle. The tables are now in use in NOAA dive programs.

At present, divers are using the Nitrox system down to 130 feet. Dr. Wells said computations for deeper depths are being tested by the Navy.

Here are a few representative no-decompression depths and bottom times: 50 feet, 200 minutes; 90 feet, 40 minutes;

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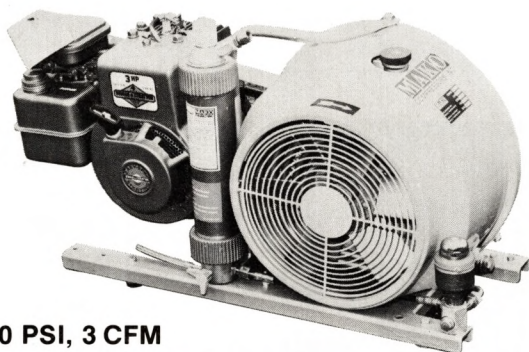


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WASHINGTON *continued*

100 feet, 30 minutes; 120 feet, 25 minutes; 130 feet, 20 minutes.

Dr. Wells has suggested raising the oxygen mix to 40 per cent for depths to 100 feet.

Oxygen-rich mixes have been around for years, but in the past they have been used primarily in closed circuit units. Dr. Wells has applied the concept to open circuit systems typically used by sport divers.

Nitrox isn't for sale at your local air station, but some industry watchers believe it's only a matter of time. Meanwhile, Dr. Wells and other experts strongly warn against experimentation.

If you're interested in further information or copies of the Nitrox tables, contact: Dr. J. Morgan Wells, NOAA, Office of Ocean Engineering, 6010 Executive Blvd., Rockville, Md. 20852.

Exploring the Monitor

A major expedition begins in August to explore the Civil War iron clad, *Monitor*. The mission will include a test excavation, gridding, photography and analysis of the ship's position on the bottom. Working together will be Harbor Branch Foundation, the North Carolina Department of Cultural Resources and NOAA.

The *Monitor* rests in more than 200 feet of water off the coast of North Carolina, and researchers say the work beginning in August will yield much data on the condition of the wreck—data needed before any firm determination can be made on its future.

That future may include raising the ship, a possibility being discussed by D'Angelo Schoenewaldt Associates, consulting engineers to the project.

The site has never been tested for excavation. Also untested are techniques for extended archaeological investigation below 200 feet using sophisticated diver lock-out systems. In July, 1977, Harbor Branch conducted a lock-out dive, recovering the *Monitor's* lantern. But the upcoming mission is far more ambitious. A test excavation will be carried out within the confines of the hull immediately inboard of the port armor belt aft of the bow. There are no tricky concentrations of structural plate in this area.

The excavation will be done by hand using a three-inch induction dredge powered by a pump on a submersible. Exposed artifacts will be mapped and photographed, tagged and carefully brought to the surface. Closed circuit

TV will monitor the entire operation.

For now, no one can say if it's practical to raise the wreck—or even if it can be fully explored while on the bottom. In the end, the historic vessel may stay where it is and remain a virtually inaccessible NOAA marine sanctuary. Still there's a 50/50 chance the *Monitor* will be on the surface this time next year. We'll know later this summer.

NSF Money Available

The National Science Foundation has launched an initial \$2 million program for applied research in earth, oceanographic and atmospheric sciences. It will be headed by the Applied Research Division of the Directorate of Applied Science and Research Applications.

NSF officials say the new project is aimed at supporting research to speed up innovations based on advances in geophysical science.

Contact man is Dr. Anton Inderbitzen, program manager, Geophysical and Environmental Sciences. He can be reached by phone: (202) 634-1607.

Down in Georgia

The Army Corps of Engineers and a group of Georgia-based historians have started on a plan to preserve the confederate iron clad, *CSS Georgia*.

Scuttled in the Savannah River in 1864, the vessel is now considered a navigational hazard. She is down in 25 feet of zero-visibility water on the edge of the main shipping channel.

The Army Corps, which now oversees the wreck, may find it impossible to raise her. A Corps official said the ship may simply be moved to a less hazardous location away from shipping after some of its artifacts are removed. Because the *Georgia* is a federally owned vessel, plans are being made to showcase recovered artifacts.

Fish Now—Not Forever

Yes, New England, the biodegradable lobster trap is on its way.

This is the latest idea being tested by Washington ecologists concerned about the impact of typical wood and wire mesh fish and lobster traps. The problem is that when they are lost on the bottom they continue to catch—forever.

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CONCH OUT ON CAICOS

The solution: biodegradables which fall apart on the bottom but not on your fishing boat.

The biodegradable traps will be a bit more expensive than conventional models, but in the long run they may increase marketable catches. They may even bring down the price of lobster.

New Light on Nukes

Uncertainty generated by the accident at the Three Mile Island nuclear power plant in Harrisburg, Pa., has given advocates of floating offshore nuclear systems a new set of problems which no one is in a position to answer.

"If you think Harrisburg was frightening, imagine a meltdown at sea," commented one Washington nuclear expert. "Nightmare is an understatement."

The Nuclear Regulatory Commission is continuing its hearings on offshore reactors, in particular those being built by Offshore Power Systems, Inc., Jacksonville, Fla. The units are capable of producing 1150 megawatts of power.

One application is now before the NRC, submitted by the Public Service Co. of New Jersey, which hopes to place a power plant three miles off the coast of America's newest gambling mecca, Atlantic City.

This prospect has given Atlantic City investors a case of terminal jitters. They realize a meltdown at sea may be a lot worse than a land-based accident. Waves and currents would spread radioactive pollution along the entire Atlantic coastline.

"One little slip and millions of dollars are gone," said one New Jersey developer, who ironically failed to mention the possible human consequences.

Meanwhile, the NRC has its hands full trying to sort out the vital statistics of the Harrisburg accident—an accident power industry officials swore could never happen.

"The offshore problems are strictly theoretical," an NRC spokesman said. But, he conceded, the Harrisburg affair makes theory more than a little chilling.

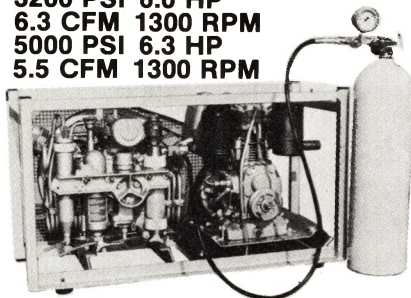
"We don't want to scare the public," he said.

That's sensible enough. But until we know more about the repercussions of a meltdown on the high seas it would make even more sense to postpone a pilot program off the Jersey coast.

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*A Guide to the Diving Resort
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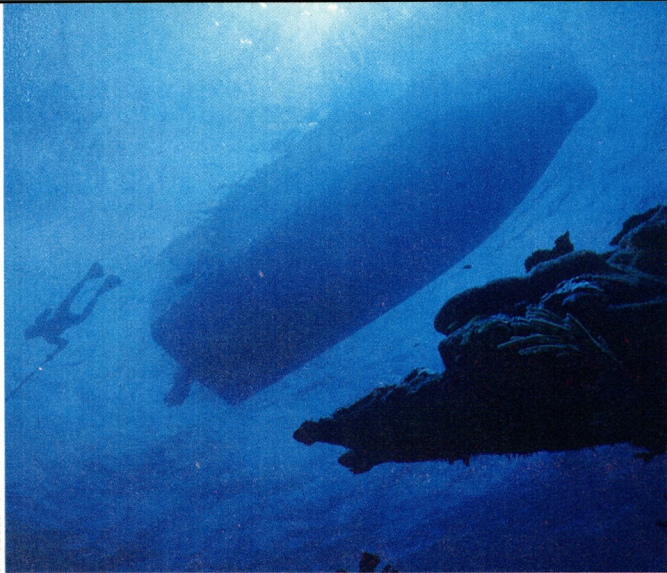
The Cayman Islands

The Caymans are more than the darling of the jet set. Black coral, friendly pelagic monsters and a 6000-foot wall prove 20,000 divers a year can't be wrong.



PAUL HURDAN

SPORT DIVER • FALL 1979



JIM COOLURIS

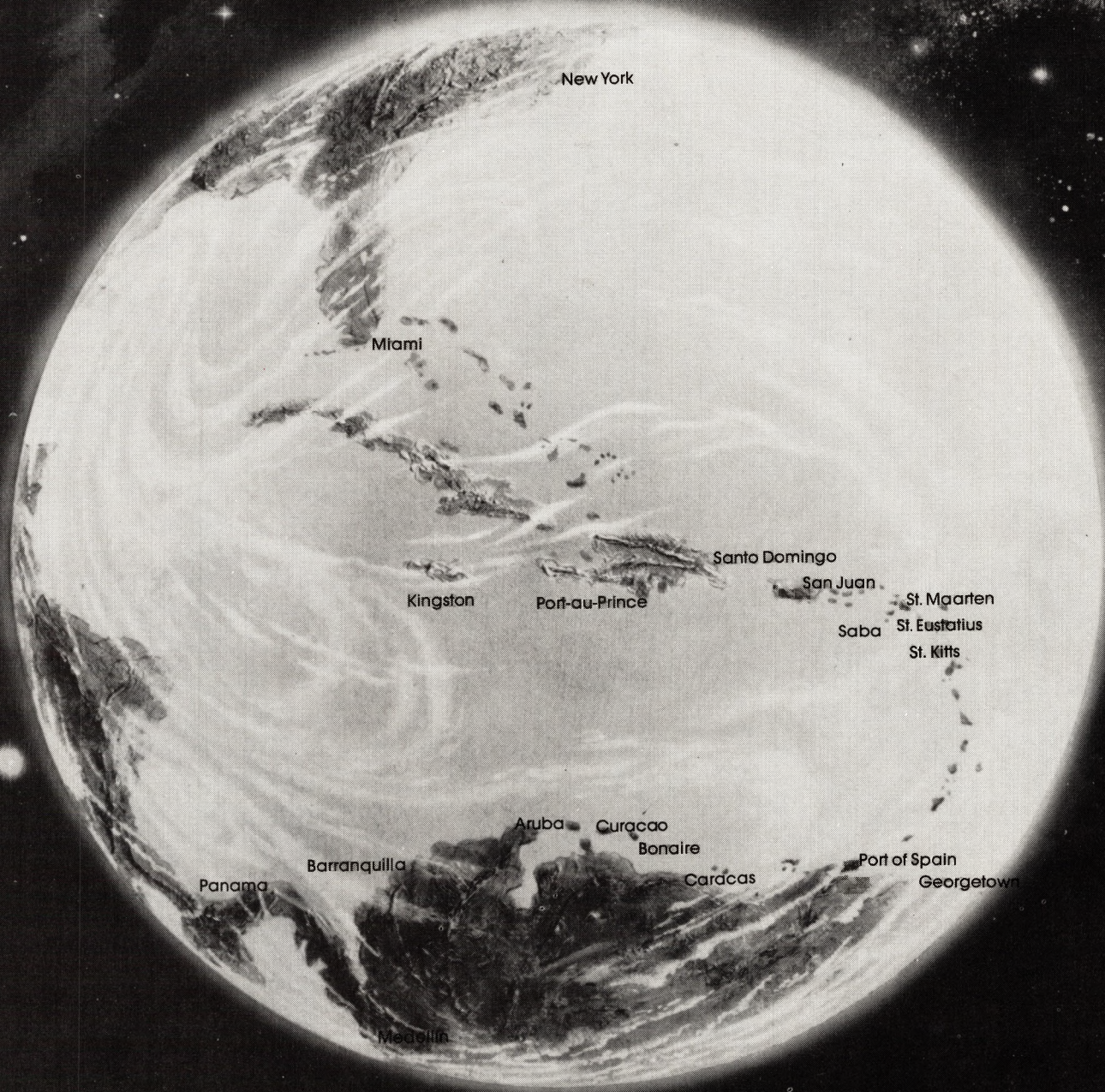
Once a sleepy diver's island, Grand Cayman has taken its place among the Caribbean watering holes for the celebrity set.

Grand Cayman

BY PHIL TRUPP



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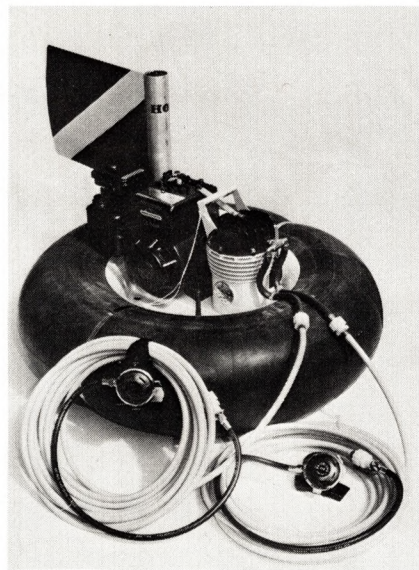


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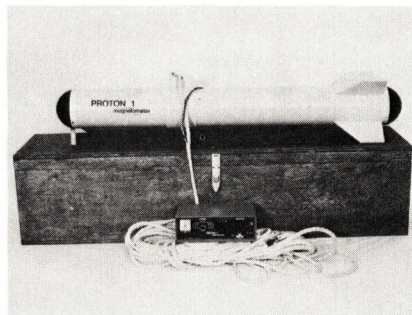
Forget fogging faceplate problems with a new cleaner and fog preventative for masks, goggles and optical glass. Special blend contains no soaps or petroleum products, will not harm rubber or metal and is safe in and around pools. Test proven under extreme conditions in the North Atlantic. Eight ounces for \$4.50 from Aquidneck Enterprises, 116 Cushman Ave. E., Providence, RI 02914.



Super Snorkel pumps air for two to 30 feet. Designed for compact transportation and quick set up, this quiet unit weighs only 42 pounds. Inflatable float follows along on the surface, carrying a dive flag, two 40-foot hoses, regulators, compressor and inflator. \$499 from Innovative Designs, 1870 Oak Creek Dr., Dunedin, FL 33528.



Pony Tank reserve air supply could save a life or finish a roll of film. Weighing only 7 lbs., 2 oz., the 19½" tank provides 14 cubic feet of air at 2,015 psi, supplying 5 to 20 minutes' extra air time. Designed as a "come home" bottle for commercial divers operating at extreme depths, Pony Tank can be used for wreck or night diving, hull inspection, or deep dives. Available with harness for attachment to the main tank. Pony Tank with valve, \$104; harness, \$10.95. From Dacor, 161 Northfield Rd., Northfield, IL 60093.



Low cost Proton metal detector locates large metal objects up to 800 feet away. Designed for oceanographic and commercial use, Proton I is a highly sensitive proton magnetometer. Operating on 12VDC, the unit can detect a 55 gallon drum at 25 feet, a barge at 200 feet and a large ship at up to 800 feet. The package consists of a small control unit, a 4-foot cylindrical magnetometer and 150 feet of tow line. \$2850 from Fishers Manufacturing, Anthony St., Tauton, MA 02780.



S.O.S. Searchlight from ACR is designed to work when you need it most. This 50,000 PCP lantern is impervious to the marine environment and floats beam up. Seek out objects up to ½ mile away or signal S.O.S. with the L-10's unique two way switch. Powered by six alkaline "D" cell batteries, the L-10 features a snap-on red lens and easily replaceable bulb. \$14.95 from ACR Electronics, P.O. Box 2148, Hollywood, FL 33020.



New competition fin by Dacor combines the power of open heel designs with the comfort and stability of a full foot fin. Available in three sizes, the new model TX-1000 more effectively transfers leg power to fin surfaces and relieves upkick tension. A special quick disconnect strap is optional. \$32 to \$34 from Dacor, 161 Northfield Rd., Northfield, IL, 60093.

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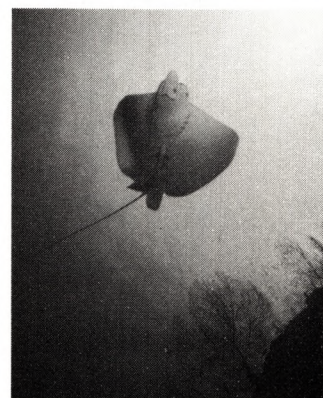
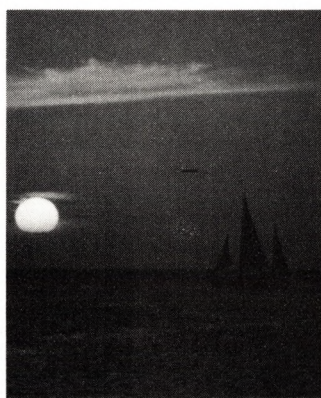
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Island Winds Beach Club

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Photos: Paul Humann

What is Interval Ownership and what is it doing on Grand Cayman?

Put very simply, interval ownership is owning a vacation home part-time. In a nutshell it's owning your vacation home for just the number of weeks you can profitably and pleasurably use it each year.

As for what it's doing on Grand Cayman Island, Interval Ownership may be the most sensible vacation and real estate value to enjoy this beautiful island in the coming years, because Interval Ownership costs are so reasonable and because the cost to vacation continues to climb not only every year, but every season. Let's face it, the cost of owning a nice vacation home on the beach is astronomical. Add furnishings, annual maintenance and the worry when you're not there — you'll see why most folks choose to rent their vacations. But renting vacations has become an expensive proposition and a one-way street to higher and higher expense.

At ISLAND WINDS BEACH CLUB you may take a vacation one week for the rest of your life and the lives of your heirs, for as little as \$2,500. That's right \$2,500. And you pay that amount just *once* in your lifetime, like any other real estate purchase.

The big difference is that you own only as many vacation weeks as you can use. Let's say a week, or two weeks, or even a month or more. And since few of us can afford to vacation 52 weeks a year, what sense is there in being responsible for the cost and upkeep of a vacation home year round?

Through Interval Ownership, you're dividing the cost of owning and maintaining an oceanfront vacation home with some other nice families who are just as practical as you, but prefer the better things in life just as you do. While you're dividing the cost and upkeep with these folks, you're also using real estate to freeze the inflation factor. Now your vacation budget can go for food, fun and all the good stuff vacations are made of, rather than high rent. Real estate ownership is a pretty good inflation fighter anywhere, but Island Winds Beach Club combines the value and appreciation of real estate with the fun and pleasure and prestige of ownership at a beautiful resort club.

As an owner, you are entitled to become a member of Interval International Inc. an international vacation home exchange network. We are proud to belong to this fine programme, that gives you the world as a vacation spot. Whenever you choose you may exchange, on a one to one basis, the week or weeks you own at Island Winds Beach Club at over 150 other club resorts subject only to availability. Affiliated member resorts are located in such areas as Colorado and New England ski country, Hawaii, Mexico Nevada, Florida, the Caribbean and throughout Europe.

We sincerely hope that Island Winds Beach Club will attract your interest, so please, when in Grand Cayman, call on us and we'll arrange a free inspection tour of our resort.



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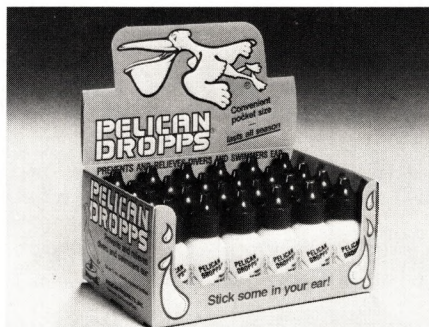
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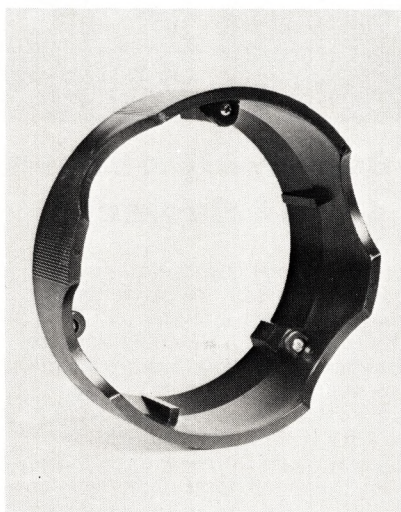
Scubaproflex Action Suit designed for maximum freedom of movement is now available in three designs for both men and women. Proflex fiber provides warmth and flexible freedom from restriction fatigue. Three models available are the jumpsuit, one-piece short arm and leg suit (pictured), and the short sleeve jacket suit. Personalized fitting available. \$80 to \$130 from Scubapro, 3105 E. Harcourt, Compton, CA.



New Flipper Slipper foot boot is designed for free divers who want a light-weight, comfortable fin boot. Glued and sewn with a double locking stitch, the Rubatex slipper is faced with sturdy blue nylon. \$9.99 from Johnson Sports, 12525 Crenshaw Blvd., Hawthorne, CA 90250.



First aid for ears is quick as a squirt from Pelican's new pocket size 14cc dropper bottle. Medically proven formula prevents and provides relief from divers' ear; handy squeeze bottle is always ready for instant use after diving when it's needed most. \$1.49 from Pelican Products, 23763 Madison St., Torrance, CA 90505.



Shield shots from stray light with a dome port shade. Easily installed on existing dome ports, this shade adds protection and blocks unwanted extraneous light for improved color saturation. Lenses as wide as 17mm can be shaded without vignetting. \$12.95 from Ikelite, 3303 N. Illinois St., Indianapolis, IN 46208.



Modular Movielite provides color balanced 3400°K light for 8mm or 16mm underwater filming. Ni-cad battery module provides 12 to 14 minutes of continuous lighting, and can be recharged in or out of the light body. Unit can be hand held or mounted to Ikelite movie housings. Addition of the Ikelite 4308 bulb increases illumination to the same output as the Ikelite Super Lite. \$174.95 from Ikelite, 3303 N. Illinois St., Indianapolis, IN 46208.



Strobe safety light marks your position from horizon to horizon. High intensity xenon strobe throws a 360° flashing light for 50 continuous hours. \$69.95 with non-corrosive case, strobe module with end cap and stainless steel hanging clip from ACR Electronics, 3901 N. 29th Ave., Hollywood, FL 33020.

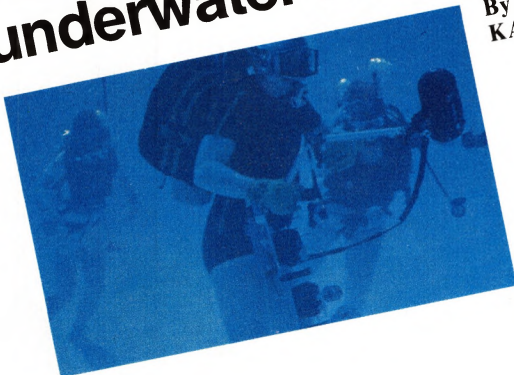


These pictures were taken at a depth of 30ft. using an ordinary camera lens and a specially-designed Clearoptic Lens.

The photo on the left is what you would see with a Clearoptic Super-Visibility Lens and photo below is what you would see with an ordinary face mask.

How you can increase diving visibility by 50% and see sharp colors underwater without the aid of artificial light.

By Ted Novak, Owner
KAPUKA WAI DIVE SHOP



Thanks to an amazing optical breakthrough, you can increase your diving visibility by 50% or more and see clear, sharp colors underwater without the aid of artificial light—whether you wear glasses or not.

If you've dived before, you know what kind of advancement this really is. At 50 feet, even in the finest diving waters, without the aid of artificial light, your visibility is reduced to a murky blue-green.

But, with the new Clearoptic Super-Visibility Lens you can see sharp, clear colors you've never seen before. The difference between the underwater visibility of ordinary masks and the Clearoptic Super-Visibility Lens mask is like the difference between black and white versus Color T.V.

How Clearoptic Super-Visibility Lenses were developed for divers.

Clearoptic Super-Visibility lenses were developed by an optical expert who is also an avid diver.

John Todd of John Todd Optical Company, the largest optical company in Ohio, has been diving around the world for years. He has never been satisfied with the decreased visibility of ordinary masks.

Putting his 20 years of optical know-how and his full-time staff of opticians and his laboratory to work, he set out to develop a

low cost, personally fitted diving mask that would give any diver optimum visibility, at any depth, in any kind of water.

How Clearoptic Super-Visibility Lenses capture light to increase color perception.

Clearoptic Super-Visibility Lens is made with a special yellow glass. Since this special yellow is in the middle of the color range which the human eye can perceive, the lens captures and magnifies all available light.

Tailored to the human eye, your eye receives thousands more color impulses than it would with an ordinary face mask lens. It is this increase in color impulse absorption which allows you to retain up to 80% of your normal color perception—underwater!

The result is sharp, clear, colors and increased visibility at any depth, in any kind of water.

Clearoptic Super-Visibility Lenses.

I have tested these lenses worldwide in the waters of Micronesia, Honduras, Aruba, Grand Cayman, Miami... even the murky waters of Lake Erie.

And, the result is always the same. Increased visibility and color perception of 50% or more, without the aid of artificial light. These lenses are especially effective for underwater fishing. Increased visibility and perception means better aim and more HITS.

How you can get Clearoptic Super-Visibility Lenses for your Personal diving Mask.

Whether you wear glasses or not, Clearoptic Super-Visibility lenses can make your diving more satisfying and adventurous.

No piece of diving equipment is more personal than a diver's own mask. That's why the Clearoptic Super-Visibility lenses are fitted right to your own personal diving mask.

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Enclosed find \$40 check/money order plus COD and handling, my prescription, PD, and rubber (no plastic please) mask.

I will allow 6-8 weeks delivery. I understand that only nearsighted prescriptions should be sent, and that this coupon must be included to entitle me to your special \$40 rate.

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A large, atmospheric underwater photograph serves as the background for the advertisement. It shows several divers exploring a sunken structure, possibly a shipwreck, in deep blue water. Sunlight rays penetrate the water from above, creating a dramatic effect. Numerous fish of various sizes are scattered throughout the scene, adding to the sense of a vibrant marine ecosystem.

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Club Caribbean, Runaway Bay, Jamaica. 7 nights. Private cottage. Daily breakfast and dinner. Nightly entertainment and disco. \$340.

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Dive Bonaire/Flamingo Beach Hotel, Bonaire, Netherlands Antilles. Underwater salt flats that change color. 7 nights. Breakfast and dinner daily. \$377.

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Left: Don't expect more than 150 feet of visibility in Grand Cayman and you'll never be disappointed. Below: Cayman Kai, on the north shore of Grand Cayman, has rental cottages, several dive boats and a good dive shop.

RICK FREHSEE



You ask for it—Grand Cayman's got it. Diving—it can be spectacular. Night life—some of the best. A place in the country to get away from it all—Grand Cayman's got that too.

That's the thing about Grand Cayman. For variety, this 22-square-mile island competes with the likes of Freeport, Nassau and St. Maarten (though St. Maarten still trades high on the jet set). In fact, it rivals a lot of medium-sized American cities.

And if you have any doubt whether Grand Cayman is rockin' n' rollin' into the 1980s, forget it.

The island's Owen Smith Airport bristles with jets. Lear Jets tell you some VIPs are around.

Customs gives luggage a thorough search. An outrageously large poster warns that grass and funny pills will get you a \$20,000 fine and ten years in jail. Be advised to leave your *Playboy* magazine on the plane. A few customs inspectors consider it sinfully x-rated, downright porn and they'll confiscate it—obviously to keep the owner from falling into a life of debauchery.

Looking for a secret bank account (more secret even than the Swiss)? How about an air-tight tax shelter? Well, there are dozens of banks from all over the world that invite those that already have it to get more—in a way that is bound to frustrate the IRS. One banker in the capital city of George Town says the island's financial machinery "invites one to be inventive—to be downright daring, I'd say."

No longer can travel writers visiting this up-and-coming Big Apple of the Caribbean pen that ubiquitous cliché, "the island time forgot." This British Crown colony which dropped out of the independence movement in the 1960s is smack into the times—and it shows.

There's Seven Mile Beach, a kind of Champs Elysée of the tropics, where the jet set mingles with the package

Phil Trupp is Sport Diver's Washington correspondent. An experienced author and diver, Phil has spent 20 years covering the Washington scene for major publications.

tours. Sick of conch chowder and grouper fingers (served spicy for the Gringos)? Drop in at Chez Jacques and have a crepe. Check out the Barefoot Man's semi-psychedelic calypso/rock lounge act at that haven for single swingles, the Holiday Inn.

Are you high on black coral? Dozens of duty free shops sell creations which range from distinctively subtle to downright ghastly. Looking for an ancient artifact, say a piece of eight? You'll find it—authenticity *guaranteed*. None of this is cheap, of course, but it's there.

If you're not into Caribbean chic there's another side of the island which may appeal. The visitor leaves the glitter of George Town and ventures into the countryside. There are small, meticulously-kept houses, magnolia and Norwegian pine. There is Gun Bay Village, a tiny hamlet living in some century but certainly not the 20th. To the north there's the village of Hell where limestone talons reach up out of the earth. How or why anyone ever built homes on this petrified terrain is one of the mysteries of Cayman. Farther north, near Old Man Bay and Rum Point, the population thins. The bush takes over. There is the Apollo-11 Bar, named for astronaut Neal Armstrong who is said to be fond of Grand Cayman and owns a home there. But mostly it's out-of-the-way island, and the occasional resort is a welcome oasis.

More than ever, it is obvious that Grand Cayman has something for everybody. I prefer to think of it as a diver's island, first, last and always.

Last year, for instance, more than 20,000 touring divers passed through. Most of them could care less about Grand Cayman's urban verve. They came to dive. They demanded quality and I suspect most of them got their money's worth. No matter how one takes the topside scene, there is general agreement that the reefs and waters around Grand Cayman are among the finest in the Caribbean. It takes ten full-time dive operations to handle the non-stop business. It's competitive and operators make it on service rendered and

continued

quality of the underwater scenery.

Even if the island has the trappings of a fast-paced mecca, it is still small enough to be a sunny Peyton Place. News—good and bad—travels fast. If one dive operator is exploiting customers the other nine will find out and apply gentle persuasion.

The day photographer Stephen Frink and I landed on the island it took only a few minutes to hear the latest dive gossip. We were told that one operator was running a barge works, crowding boats and shorting air.

"Now," confided our source with

an air of indignation, "that kind of foolishness is bad for the island—bad for business."

"What can you do about it?" I asked.

Our source looked at me as if I were slightly sun-stroked. "Well, we'll do *something*, I'm not saying what."

There you have it, America. Free enterprise. Right down to the reef. It's what the Carter Administration's clown prince, Alfred Kahn, has been haranguing us about ever since he became the Czar of Anti-Inflation: raw, no-holds-barred competition. If you don't like a dive operation you can walk across the street and negotiate a better deal.

The same applies to resorts. There are 17 modern hotels, apartment villas, guest houses, cottages and condos enough to house a Republican convention. You can opt for luxury or spartanism, champagne or greenies (Heineken is the national elixir of the Caymans), a Dior original or cut-offs and tee-shirts. In the big Caribbean Apple it's a buyer's market.

The paranoia which greets you at customs doesn't last long, thankfully, because the Caymanians are a gentle people. They are proudly polyracial and they wink at the let's-root-out-evil syndrome. After all, in the past the Caymans have been home to a gallery of blood-thirsty pirates and a tourist with *Playboy* couldn't be very dangerous. Like many who live by the sea and must bargain with her, the Caymanians understand it is wiser to accept than to harass your fellow-person.

All of this is superficial anyway. As I said, it's a diver's island and that's how most of us choose to see it.

If the Caribbean were transparent you would see the Cayman Islands (Grand Cayman, Cayman Brac, Little Cayman) as three tiny fingers of rock at the peak of a vast submarine mountain range, the southern Sierra Maestra. In the direction of Jamaica, to the east, is the Cayman Trough, an incision in the sea floor four miles deep. Toward Honduras is the Bartlett Deep. This amazing submarine geography makes the Caymans what they are and has literally shaped a legend.

When most divers think of Grand Cayman they immediately think of the Wall. There are walls—the flanks of islands plunging into the abyss—throughout the world. But those of Grand Cayman have achieved special status. It is fitting that "Grand Cayman" sounds,

Below: The 6000-foot North Wall is pocked with caves and tunnels such as this one off Cayman Kai in about 90 feet of water.



PAUL HUMANN

to some, a little like "Grand Canyon."

I've been to the island twice and am particularly fond of the so-called northeast wall. For me, it's the essence of Cayman wall diving. The drop-off, which begins about 100 feet down, suddenly falls straight away 6000 feet into a hard, visible abyss. It is awesome, a bit scary.

At a site called the Northeast Pinnacle I got brave and swam straight into the blue, then turned around so I might get a better feel for the wall's magnitude and proportion. I won't soon forget the chill it gave me. I was facing a mountain of coral and stone extending to the very limits of vision. I hung there trying to comprehend its power. A big eagle ray swam by, distracting me for a moment and, oddly, making me feel more in touch with reality. I was so small, so laughably fragile. I stared down into the emptiness where shades of blue graduated into blackness, where rays of sunlight vanished. Far below me I noticed something quite strange: a shimmering band of silver which alternately appeared and disappeared along the entire length of the mountain. I later confided this to Dave Woodward, the famous diver/photographer who is on intimate terms with these waters.

"You saw the ledge," he said matter-of-factly. "Incredible, isn't it?"

Well, yes, it was, and it was even more so when Dave informed me that the ledge I had seen was 600 feet down, the last known plateau before the island drops like a shot into the darkness.

This is the wall at its best and as I now recall it. It is startling, unpredictable, full of surprises. Let me tell you



CARL ROESSLER



Above: A mature basket sponge and a brittle star on the North Wall. Left: Grouper and trumpet fish on Grand Cayman's fringing reef.

PAUL HUMANN

continued

about one of these surprises, one that is not typical in itself, but seems to be the essence of Grand Cayman.

There is a place on the wall known as The Three Sisters. These are elaborate coral formations rising a full 30 feet or more from the crest of the drop-off. To reach these Sisters one swims along a plateau at 60 feet and into a narrow canyon, leading to the drop-off.

On this particular morning I had lagged behind the group and hung around the boat. After a while I headed into the canyon toward the Sisters. I had gone only a few yards when I saw it—a black-tip reef shark, and it was rushing toward me like a torpedo. Raw instinct curled my body into a fetal ball and I covered my mask with my arms. The shark whizzed beneath me, creating enough turbulence to turn my body completely around. When I looked I was facing up the canyon in the direction from which I had come only seconds ago. The shark executed a hairpin turn and hurled itself at me again. I shoved my camera in front of me and the shark dipped its nose and buzzed the tips of my fins. Then it was gone.

Back on the boat the divemaster wondered where I'd been.

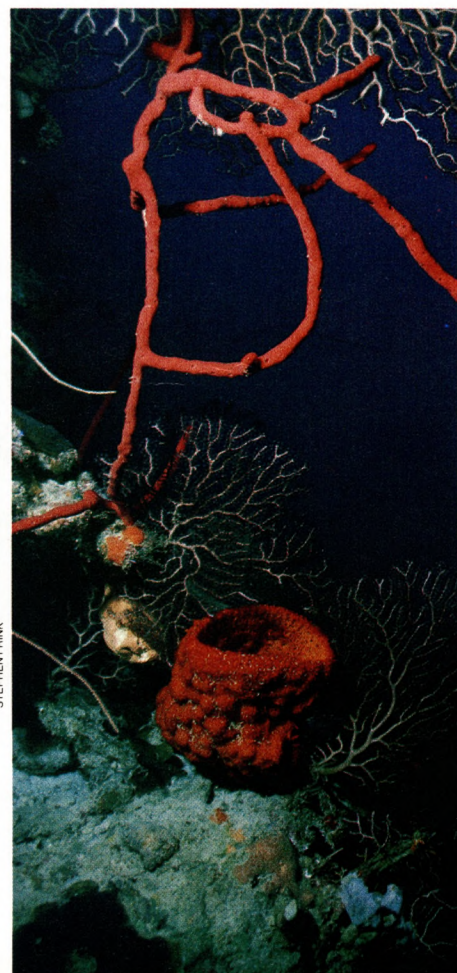
"You should have been with us," he said. "There was a black-tip down



PAUL HUMANN



STEPHEN FRANK



CARL ROESSLER

Top: Delicate coral polyps on the south reef. Above: Huge tube sponges dwarf divers on the North Wall. Right: A basket sponge among gorgonians on the fringing reef south of George Town.

there, sleeping." The divemaster had taken a number of photos, then prodded the animal with his billy to stir up a little action.

"It was hell getting him to move. But once he woke up—why are you staring at me that way, Phil?"

Divers rarely see sharks. Some never do. Yet the startling impact of this encounter, bizarre and unlikely as it was, seemed to typify the surprising elements of the Cayman Wall. It's a place you're likely to see things you may have only dreamed of.

And you will definitely see them. The Caymans are noted for good visibility. The islands are basically flat and composed of porous limestone. There aren't any sludgy industries and no run-off to speak of. Now and again there are peculiar cold currents known as Arctic highways, no wider than your living room, which appear to banish organic matter from the water. When the sea is calm there will be an average of 100 feet of good, snappy visibility. I have dived Grand Cayman when the sea is flat and, more recently, when winds out of the north churn up whitecaps and swells of six or more feet. I have seen visibility at more than 100 feet and as low as 30. But in my experience visibility has usually been beyond 100 feet on deeper dives.

A large barrier reef encircles much of the island and the drop-off is never more than a 20-minute boat ride away. In some spots the drop-off is just below the surface.

We discovered one of these shallow walls while diving out of the elegant Cayman Kai resort (*Kai*, they tell me, means happiness) on the north shore. The top of the wall crests only 35 feet from the surface. Called Gale's Mountain, after Kai manager Gale Anspach, it rises out of the depths to a sharp peak. This allowed us to drink in the ambience of the wall with a maximum of bottom time. On this particular dive a big stingray cruised our location. I eased my way toward it and tried to make nice to this underwater flying saucer. I wasn't nice enough. The stingray seemed to grunt and sailed easily out of range.

Along the island's south side are places where the wall is only about 150 yards from the beach. One operation, F.L.A.G. Underwater Services, does a brisk beach diving trade. It's not bad. It's simple and easy, and for those among us who hate boats (there are

many more than you think!) it's the only way to dive.

This is remarkable when one considers that more than 20,000 divers descend on Grand Cayman each year. Not all of these adventurous folks understand the fine etiquette of reef visitation. They're not callous, just a bit inexperienced. They touch things—sometimes rudely. Big power flippers from the north have an adversary relationship with fragile stands of stag and elkhorn. Anywhere you go in the Caribbean you will see a fair amount of anchor damage. But those big, black, power-when-you-need-it fins cause the destruction of untold tons of coral. Please be warned: When you visit the Caymans—Grand Cayman in particular—it is good manners to keep probing fingers and turbo-jet fins off the merchandise. This isn't an offensive requirement and it makes good sense.

The reefs of Grand Cayman have seen many divers. Through it all they have survived in generally good condition. A healthy reef is a pleasant place to visit. This is the slogan of Cayman's vocal (and effective) conservationists. They come at you from the bottom line and they are to be taken quite seriously.

"If we didn't remind people to treat our reefs as if they were made of fine china it wouldn't be long before there'd be no reefs or visitors to worry about," was the way one conservationist put it.

Anyone who has traveled the Caribbean must see the truth in this. It would be unfair to name those few islands whose reef damage amounts to an ecological scandal. Those who've seen it know of which I speak. But the Caymans aren't going to be put in such a position. Grand Cayman is a survivor island. It refuses to be cut, chipped, picked over, stomped on or chiseled into oblivion. No coral may be taken. Not even dead pieces lying white on the bottom. There are dive operators who won't let you back on the boat if you come up with coral in hand. If this offends you, don't visit the Caymans. You'll be glad you didn't.

But there is some irony here. Rare black coral forms the basis of a lucrative and much-advertised Caymanian trade. A few jewelers swear the black coral comes from other islands, although they never say where, and a few public officials speak vaguely of regulating the harvest. But for the visiting diver the rule is firm: Don't touch! Again, it's the old bottom line.



Above: An angelfish browses among stands of finger coral on a shallow reef just off the south shore of Grand Cayman.

My advice to purchasers of black coral jewelry is to follow the old rule of understatement. If more people did, those tasteless creations—for instance, black coral elephants set in gold and peppered with worthless diamonds—would be fewer, and the oceans and the divers who explore them would be better off.

If you want to get away from all that coral for a while, you'll find a few wrecks to dive in Grand Cayman. Perhaps the best known is the *Balboa*, which lies in 35 feet of clear water in George Town harbor. Dynamited as a hazard to navigation in the 1930s, the *Balboa* is considered a rich wreck. Parts of the hull are intact and one boiler serves as a kind of open water aquarium.

The *Balboa* is standard night diving fare. Bob Soto's operation handles much of this trade, but he is by no means the only one. It isn't the most breathtaking wreck in the Caribbean, but at night the *Balboa* is as colorful and fishy as most. It's pretty good for macrophotography and in the day it serves as a respectable backdrop for people pictures.

A quick sketch of the island's major dive operations may help you choose your ultimate destination:

Bob Soto is inescapable. He is Grand Cayman. Soto is part Cuban, part Caymanian. His wife, Elita, is a Caymanian whose relatives are influential in the political life of the island. The Sotos own several free port shops, a dive operation on Seven Mile Beach and

continued

Right: The coral-encrusted wreck of the Balboa lies in 35 feet of clear water in the George Town harbor.



PAUL HURMAN

the East End Lodge. The lodge is a nitty-gritty, no-frills operation which has inescapable appeal for the hard-core. There isn't a breath of night life on the east end but the diving can be extraordinary.

Surfside Water Sports, also on Seven Mile Beach, runs two tank trips in the morning, dives and snorkel trips in the afternoon, night dives, and owns two glass bottom boats. Surfside advertises dive charters—a very wet operation with lots of activities.

Sunset Divers, Ltd., South Church Street, has flexibility and can arrange schedules to fit different groups and different interests. In the area where Sunset is located, the reef is fairly close to shore. You can dive just about any time you wish. If you miss the boat, grab a tank and dive off the beach.

Talking about the wall is unavoidable. Cayman's promo justifiably flaunts it. When they show a sleek lady curving into the blue and extend the invitation to "Drop into Another World," it's the wall they're talking about. True, the wall is another dimension. But it would be a mistake to overlook the shallow reefs. I am a great stickler on shallow diving—it's my favorite kind—and the reefs at Grand Cayman offer some excellent examples.

There are certain basic elements

critical to shallow water tropical scenery: lots of light, color, a variety of marine life, unique coral formations and, above all, healthy coral. In varying degrees Grand Cayman provides it all.

The venerable Tortuga Club has gone through many incarnations. It remains alive and well and shares the east end with Soto. Guests at these two places are practically the only divers around, which can be very comfortable. Deep and shallow dives in this area are excellent: The Tortuga runs a full schedule and makes night dives.

Spanish Bay Reef has excellent diving facilities and one of the best restaurants on the island—some visitors swear by it. They say it combines elegance with functionalism. It is located a half mile from the end of the north sound fringing reef and has a moderate depth fringing reef within swimming distance of the door. If the wind behaves, Spanish Bay will dive the rich north coast. If it blows the boats go south and west.

Casa Bertmar Dive Resort also maintains a good reputation. Some think of it as a hard-core diver's den. Others like what they perceive as a homey atmosphere and better than average accommodations. Located at South Church Street, Casa Bertmar has a dive boat and makes trips to the west side reef. It has a special attraction:

Waldo, a big moray, very green and about six feet long. Waldo, spoken of affectionately as a pet, is said to be gentle, fun, easy to hand-feed and a good photo subject. I have never been one for oooing and ahhhing over morays—they are lazy and indolent, though I've seen a few leave their hiding places and put on a fine performance. Anyway, Waldo, cutie of the deep, is there if you need him.

Seasports, on Seven Mile Beach, is one of the few operations on the island that lets experienced divers go deeper than the sport diving limit. Gil's Grotto, a relatively secret spot, offers the visiting diver a chance to see unique marine life and sponge formations that live at 190 feet. This is a decompression dive, and Seasports is careful to take only experienced deep divers. So far, only 29 have made the dive.

Cayman Kai, on the north shore, calls itself a planned community. There are cottages and privately owned homes for rent. It has several dive boats and a good dive shop. The Kai dives every day (a tank in the morning, another in the afternoon) and can arrange night diving. Gale Anspach, the manager, is an old dive hand and understands the needs of his guests, most of whom are repeat customers.

Grand Cayman is also home port for two live-aboard dive boats, the *Cayman Diver* and *Ports of Call*. Both have outstanding reputations. Old Cayman hands say they offer the best in the area.

The *Diver* is an 86-foot converted Coast Guard cutter with twin diesels. *Ports of Call*, a flamboyantly decorated boat, is a steel-hulled converted cargo vessel, 93 feet long, with sail and motor power.

These boats offer what amounts to unlimited diving. You stay wet as long as the tables hold out. They also search out some very original, sometimes virgin, sites. If the weather is good they may head for Cayman Brac or Little Cayman, about 90 miles offshore.

Will success spoil Grand Cayman?

"This is our home," one Caymanian remarked. "It's our life. If we become bigger it doesn't mean we'll forget what's really important."

We hope not.

Progress and conservation can be outlandish bedfellows. It will take skill, brains, diplomacy and maybe even a fair amount of sacrifice to save for the future a submarine world as unique as that offered by Grand Cayman.

GRAND CAYMAN

GENERAL

Location: 480 miles south of Miami and 178 miles northwest of Jamaica
 Size: 76 square miles
 Topography: a flat island with sloping beaches
 Climate: tropical with 62 inches of precipitation annually
 Population: 12,000
 Largest towns: capital George Town (pop. 3812); West Bay (pop. 3000); East End (pop. 1000)
 Language: English
 Ethnic composition: 54% mixed, 26% black, 19% European, 1% Indian
 Economy: 3% agricultural, 20% industrial, 35% tourism, 24% finance, 18% government
 Monetary unit: Cayman dollar = \$0.80 to \$1.20
 Diving season: year-round
 Tourist season: year-round

DIVING

Water temperature: winter 78°-80°, summer 80°-82° F
 Visibility: 100-110 feet, rainy season May-Oct reduces visibility to 90-100 feet
 Depth of dives: 20-150 feet
 Currents: 1-3 knots
 Tidal fall: 1½ feet
 Types of diving: reef, wreck, wall, night, cave, drift, beach
 Skill level: novice, intermediate, advanced
 Dives per day: 4
 Diving craft: excellent
 Sights:
 Fish: snapper, grouper, angel, triggerfish, sergeant-major, trumpetfish, barracuda
 Coral: star, elkhorn, staghorn, wall, tunnel, cave, black coral
 Sponges: glass vase, basket, tube, covering sponge
 Shells: queen conch, helmet, flamingo tongue, murex, bonnet
 Invertebrates: lobster, conch, crab, octopus, squid, brittle star, nudibranch, sea cucumber
 Other: dolphin, turtle, garden eel, moray eel, shark, ray
 Restrictions: No collecting or fishing with scuba gear; no spearfishing; lobster in season only; ten conchs per person per day

DIVING SERVICES

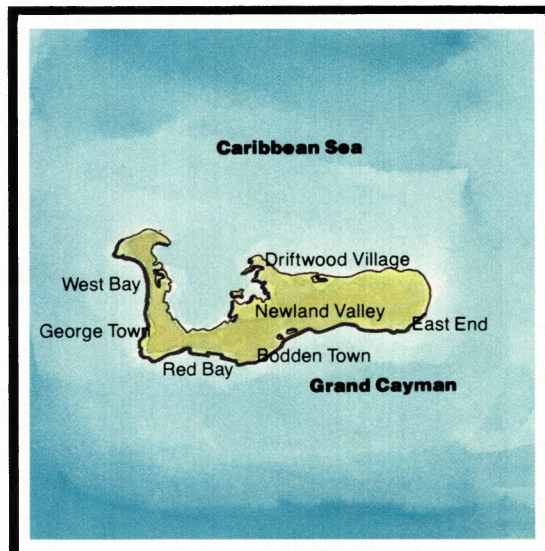
Instruction available: resort course, open-water certification, advanced open-water certification, underwater photography
 Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge, depth gauge, compass, decompression meter, full wet suit, partial wet suit, knife, game bag, dive light, Nikonos, camera housing, underwater strobe
 Equipment sales: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge, depth gauge, compass, decompression meter, full wet suit, partial wet suit, knife, game bag, dive light, Nikonos, camera housing, underwater strobe
 Equipment repair: good
 Camera repair: good
 Air: to 3500 psi
 Guides: excellent

DIVERSIONS

Ground transportation: bus, taxi, rental car, motorbike, bicycle
 Shopping: good and reasonable
 Restaurants: excellent and reasonable, average meal \$8-10
 Nightlife: good
 Other sports: sailing, fishing, tennis, water

Where a notation "fair," "good," or "excellent" appears after an item, such as guides or diving craft, it refers to the *availability* not the quality of the services.

SPORT DIVER DESTINATION DATA



PLANNING

Diving tours: Beach Club Colony, Box 903, West Bay Beach, ph: 9-2023; Bob Soto's Lodge, Box 894, Grand Cayman, ph: 9-2483; Casa Bertmar, Box 637, Grand Cayman, ph: 7-2573; Cayman Kai, Box 1112, North Side, ph: 7-2573; Grand Caymanian, Box 904, Grand Cayman, ph: 9-4091; Quabbin Diver, Coral Caymanian Hotel, Grand Cayman; Royal Palms, Box 490, Grand Cayman, ph: 9-2636; Scuba Cayman, Box 746, Grand Cayman; Spanish Bay Reef, Box 800, Spanish Bay, ph: 9-3765; Spanish Bay Villas, Box 1200, Spanish Bay, ph: 9-3272; Tortuga Club, Box 496, East End, ph: 7-2488
 Land tours: Cayman Island Taxi Association, George Town; rental cars available
 On your own: Airlines—Cayman Airways, 250 Catalonia, Coral Gables, FL ph: 305-526-5470; LACSA, 550 NW Lejeune Rd., Miami, FL ph: 305-445-8737; Red Carpet Airline, St. Petersburg-Clearwater Airport, Clearwater, FL ph: 800-237-3803, 813-996-4944; Southern Airways, 25 SE 2nd Ave., Miami, FL ph: 305-379-7501
 Airports: Owen Roberts International Airport, George Town
 Cruise lines: Year-round: Norwegian Caribbean Lines; winter season: March Shipping Corp., Sun Line Agencies, Carras/Delian Cruises, Norwegian American Lines
 Marinas: Harbor House Marina, P.O. Box 26, George Town
 Accommodations: Hotels: Caribbean Club, Box 504, West Bay Beach, ph: 9-2593; Casa Bertmar, Box 637, Grand Cayman, ph: 7-2573; Cayman Kai, Box 1112, North Side, ph: 7-2573; Coral Caymanian, Box 1093, Grand Cayman, ph: 9-4054; Galleon Beach, Box 71, West Bay Beach, ph: 9-2692; Grand Caymanian Holiday Inn, Box 904, Grand Cayman, ph: 9-4091; Royal Palms, Box 490, Grand Cayman, ph: 9-2636; Rum Point Club, Box 510, Rum Point, ph: 7-2535; Spanish Bay Reef, Box 800, Spanish Bay, ph: 9-3765; Sunset House, Box 479, George Town, ph: 9-2511; Tortuga Club, Box 496, East End, ph: 7-2488; Apartments and cottages: Cayman Sands Village, Box 307, Grand Cayman, ph: 9-2030; Cocoplum, Ltd., Box 1560, George Town, ph: 9-5959; Harbour Heights, Box 688, West Bay Beach, ph: 9-2295; Limetree Bay, Box 1557, West Bay Beach, ph: 9-5745; London House, Box 1356, West Bay Road, ph: 9-3600; Seagull, Box 1349, West Bay Beach, ph: 9-4707; Seascape, Box 170, West Bay Beach, ph: 9-2711; Silver Sands, Box 205, West Bay Beach, ph: 9-3343; Bob Soto's Diving Lodge, Box 894, Grand Cayman, ph: 9-2483; Spanish Bay Villas, Box 1200, Spanish Bay, ph: 9-3272; Tarquyn Manor, Box 1362, West Bay Beach, ph: 9-3538; Tradewinds, Box 62, Pease Bay, Bodden Town, ph: 7-2091; Victoria House, Box 636, West Bay Beach, ph: 9-3283; West Indian Club, Box 703, West Bay Beach, ph: 9-2494; Whitesands Beach Cottage, Box 480, West Bay Beach, ph: 9-3345
 Campgrounds: none
 Customs and Immigration: Requirements—passport; U.S. Citizens: driver's license or birth certificate
 Import restrictions: animals and plants require U.S. Dept. of Agriculture permit; illegal drugs prohibited
 How much cash may you bring into the country? no limit
 Export restrictions: none
 How much native currency may you take out of the country? No limit
 U.S. Customs re-entry restrictions: no agricultural products or uncertified turtle products

ILLUSTRATIONS: DON WARREN

CAYMAN ISLANDS

skiing, snorkeling, miniature golf, go-carts, squash, cricket, rugby
 Don't Miss: Hell, North Wall, Richfield wreck, Waldo, Cayman Turtle Farm, Kirk's Freeport, Sunday brunch at Cayman Kai

JUST IN CASE...

Hospitals: Cayman Islands Hospital, George Town, ph 9-2121 or 9-5555
 Diving doctors: Dr. James Poilson, Cayman Clinic, George Town, ph 9-4234 or 9-2060
 Recompression facilities: Cayman Clinic, George Town, ph 9-4234
 Police: ph 9-4222 or 999 for police & fire
 Marine Rescue: ph 9-4222
 American Express: Bank of Nova Scotia, George Town, ph 9-2381
 U.S. Consulate: none

Cayman Brac and Little Cayman

*Yes, there are still virgin dive sites
in the Caribbean.*



PAUL HUMANN

Cayman Brac is less than an hour by air from Grand Cayman. But the difference is a world apart.

Brac is a smaller island with fewer than 2000 people. Its intriguing sister island, Little Cayman, has 20.

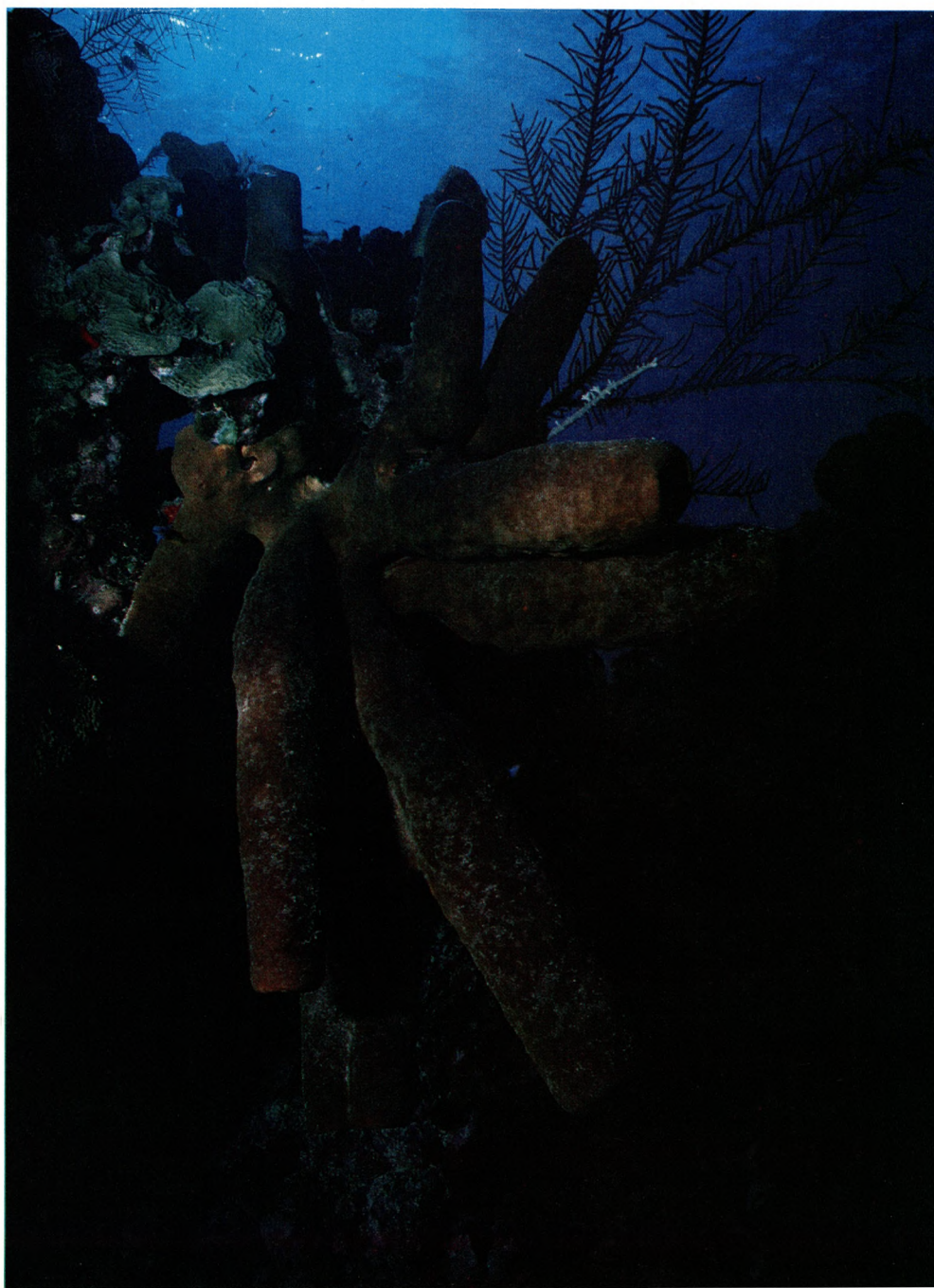
Most male Brackers are seamen who ship out on the big freighters. When you meet them in the beach bars they are warm and friendly. A Brac seaman and I danced together with an American girl. He said it looked as if it would take two of us to entertain her properly.

The women have lovely features, rather delicately designed, and very dark eyes. They are a bit shy with visitors. On the dance floor they will not engage a gringo's eye; it isn't dignified.

But it takes only a couple of days for everyone to warm up, and a diplomatic visitor is then invited into the everyday life of the island.

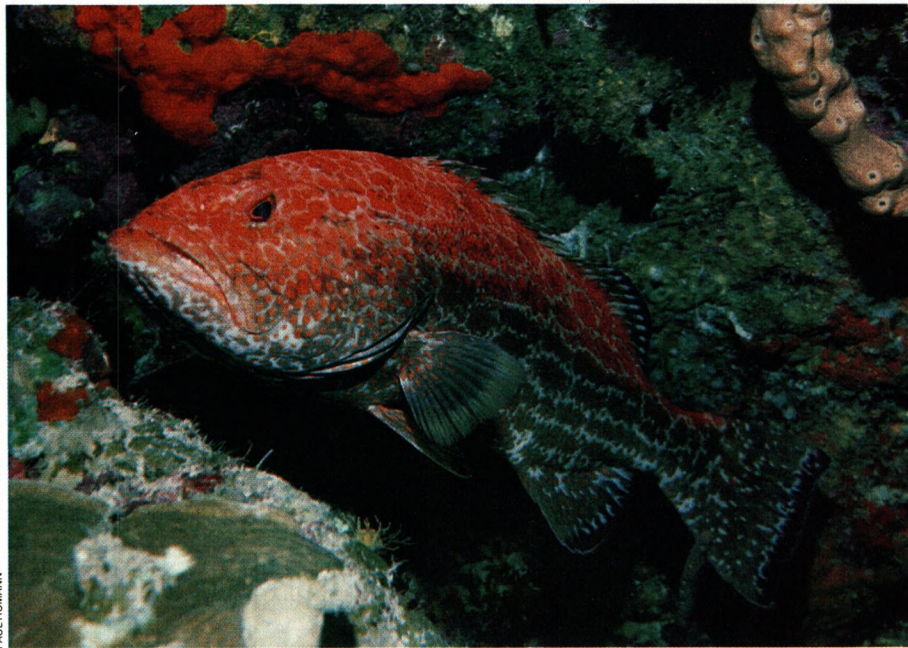
Home for visiting divers is one of two places; the old-line Buccaneers' Inn, where we stayed on the north side, or the relatively new Brac Reef Hotel, a few miles away on the opposite shore. Both have good accommodations with many small amenities, and, of course, diving is the big attraction.

It's easy to see why. What seems so striking at the Brac is the abundance of unmolested coral, coral with remarkable form and mass.



PETE SALOT

*Top: Feather plumes on Little Cayman's
north wall. Right: Deep sponges in a
coral canyon off Cayman Brac.*



Left: A grouper foraging among coral passages on Cayman Brac's south wall.

I was especially impressed by the shallow diving. Shallow reefs have a way of defining the character of an off-shore area and are distinct from island to island, which is one way of knowing where you are in the Caribbean.

The reefs of Cayman Brac are still basically unexplored. The primary structures of star coral form a series of mazes. The walls are high, rising ten to 25 feet from the bottom, and they often describe a complex network of chambers and canyons. We would duck into these canyons and discover lively aquariums. I found tropicals I hadn't seen before and we were intrigued by the tiny odd-shaped fishes with unfamiliar markings.

At one reef I swam through a passageway and came to a castle made of coral with a circular mote and high towers. I swam directly into the formation and came out at the top.

Steve and I burned no less than 24 tanks of air and our best estimate of the average water clarity is as follows: shallow dives, 75-100 feet; deep wall dives, about 120 to an occasional 175 feet (some claim 200). That's excellent Caribbean visibility, especially considering our arrival during the March windy season.

Captain Tom, of the Eastern Dive Boat Association, concurs: "On a scale of one to 10 I'd have to rate the Brac at the top," he told us. "It's some of the best all-around diving you're going to find." His basic beat is hard-core north Atlantic wreck diving, where the sights are deep, dark and cold. It seemed odd that his wetsuit jacket sported a pointed collar, as if it were a dress shirt. Perhaps this was for formal diving after six, or maybe a neoprene bowtie was added for

burials at sea. As Captain Tom was our resident guru I didn't feel it polite to ask about this.

A good deal of credit had to go with our dive guide, 27-year-old Terry Burke, a native Bracker with almost half his life spent on scuba. Terry was one of those naturals in the water. He understood the reefs and wanted us to see the best—with some original exploration on our own.

The first dive anyone makes at the Buccaneer is a beach entry from the "ironshore" behind the resort. Winston McDermot, who oversees the Buccaneer's dive operation, says you can tell a lot about a diver's ability by the way a beach entry is handled. He and Terry brief the divers and check them out as they enter.

It's a short swim along a white sand bottom to a gentle slope at about 15 feet. Then it's down to a 40-foot bottom and a patch reef with two fairly big coral formations; one forms a gentle hill, rising ten feet off the sand, the other is larger, and is shaped like a mushroom. These are moderately rich formations, considering the many divers who visit them, and they provide a mellow way to warm up to the Cayman Brac scene.

The next day we were introduced to the boat diving schedule: a deep dive in the morning, typically 100-120 feet on the wall, followed by a shallow reef at 25-50 feet. We averaged about 80 minutes of bottom time for both dives. Sometimes there'd be a third boat dive after lunch, or another beach dive. A nice extra on the deep dives was having plenty of air to carry down. We used aluminum 80s pumped to 3200 psi. This was Winston's idea. He thinks giving a

diver lots of air is a safe, comfortable way to go.

It should be noted that Winston's operation, Brac Aquatics, Ltd., has within the past year put more than 1200 divers in the water without a single serious accident.

Brac Aquatics is a thoughtfully run operation. It is well-equipped with 220 tanks, three boats and a 42-foot trimaran with live-aboard facilities. The trimaran was, at the time of our visit, scheduled for all-day trips to Little Cayman, which is seven miles north and west of the Brac.

Winston's shop provides a line of rentals, but it's sensible to bring the basics with you: mask, fins, snorkel, BC, regulator, gauges and a wetsuit.

One night, after an excellent meal of baked trigger fish, Winston and I walked together to the ironshore to watch the night divers. Behind us the thatched bar was in full swing. The juke box and the loud voices were an odd ambience in the dark. For some reason I imagined that night dives should be carried out in absolute stillness.

Winston talked about visitors from the States who view the Caribbean as a totally benign mistress.

"Those are the ones you've got to watch all the time," he said. "They want to go as deep as they can because it seems so easy."

But most of them have little or no resistance to narcosis. Winston said that in any group of touring sport divers at least a third will be seriously narced at 100 feet.

"You see them watching their gauges, sinking like stones. It's scary."

On deep dives Winston will patrol the top of the drop-off. He swims slowly back and forth, like a sentry, hardly burning up his air and hoping that the couple from Boise doesn't take a mind to make a super-deep bounce.

"I can just sense if a diver knows his stuff," he said. "Most good divers

continued

don't make a big issue of going deep. We get below 100 feet—and we'll go deeper sometimes if the people are experienced. But good divers, the ones who've been around, don't make a silly contest of it."

For Winston, diving is pleasure and excitement. It is also a learning experience. It's not a way to express hostility.

"Those macho guys are accidents waiting to happen," Winston said. "We don't push it. That's not what diving is really about."

Meanwhile, our logs were filling up rapidly. One shallow reef produced these unedited notes:

Beautiful, almost artistic coral formations. Passageways and grottoes are steep and filled with life. The scene is a mixture of sci-fi and Tolkien. From the peak of a coral head visibility is 100 or more feet; too good to be judged, really. I am surprised by the bright, healthy coral. A big blue and black parrot lets me swim with it. Steve snaps me with a wide gray angel. Must remember to name the species: a big golden trumpet fish; lots of blennies and wrasses; puffers; strange looking groupers (look like tropicals in a tank); barracuda (mostly small); blue tangs; surgeons. If I were an ichthyologist I would have achieved a kind of nirvana.

One morning I visited with Jim Ketrow, divemaster at the Brac Reef Hotel.

Jim's history is remarkable—even novel. The question arises: How did a 31-year-old art student/sculptor turned semi-pro baseball player and boxer, later a "store opening supervisor" for Super-X Drugs, ever wind up with a dive business in the Caribbean?

The former light-heavyweight champ removed his Tampa Bay Rowdies soccer cap, smoothed his thinning hair, and replied: "Just lucky, I guess."

Jim had been diving for several years when it occurred to him that working for Super-X Drugstores wasn't much fun. So he left his native midwest in 1975 and joined the World of Water dive shop in Tampa, Florida. He became a PADI instructor and divemaster for World of Water's Caribbean tours.

On a trip to Grand Cayman he was introduced to Winston. They liked each other and Winston invited Jim to join his dive operation on the big island. Later, when Winston departed for the Buccaneers' Inn, Jim went with him.

The chance to head his own shop came in January, when Joe and Jane Chadima purchased the Brac Reef. Jim's

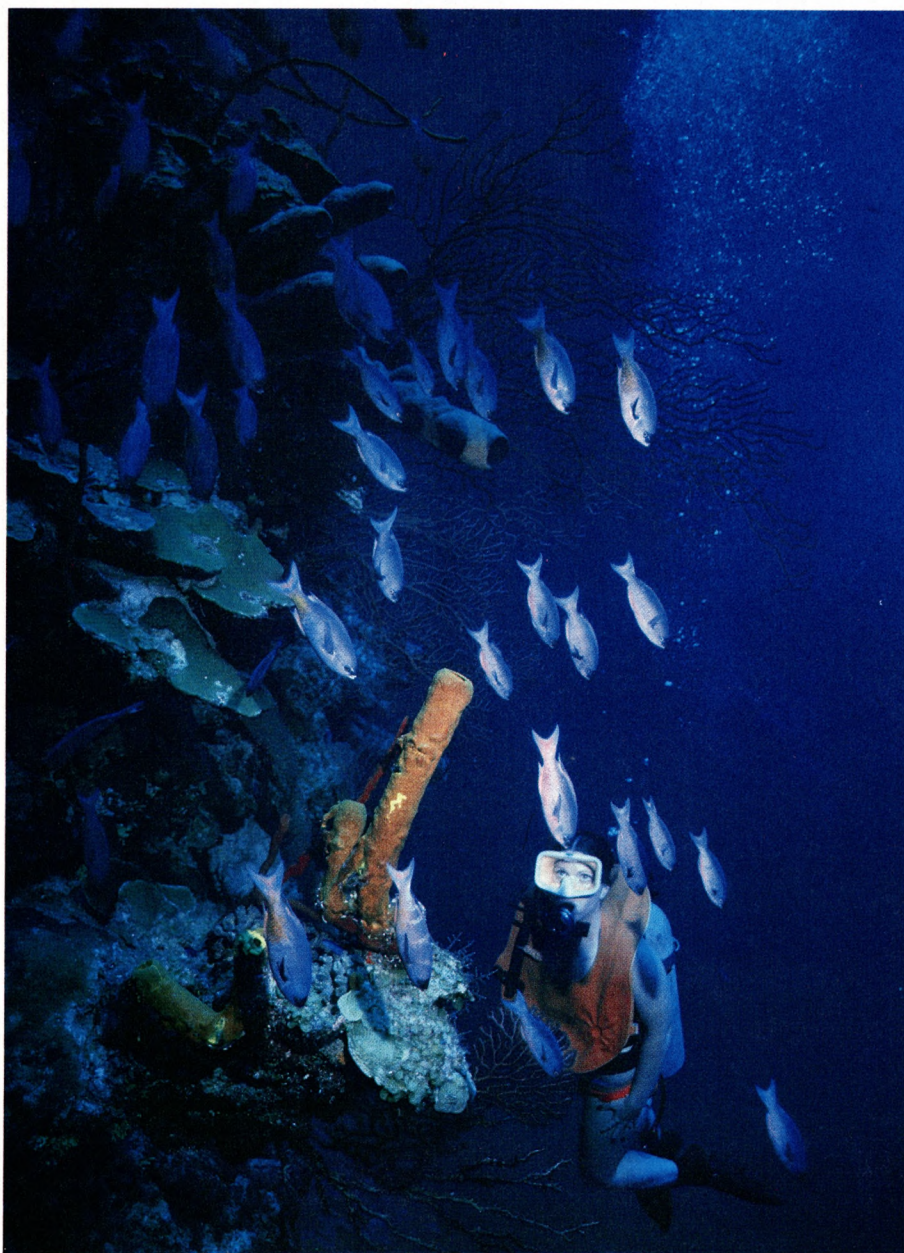
operation must bear one of the most poetic titles in the Caribbean—Maelstrom Divers, Ltd. It is taken from the infamous whirlpool off the coast of Norway and from the title of a chilling short story by Poe. (Small maelstroms are seen at Little Cayman but no one is crazy enough to dive into them.) Jim said the idea of the mysterious Norwegian whirlpool appealed to his imagination and reminds divers that they must overcome powerful forces. Having said this, Jim emphasizes that safety is first.

Maelstrom Divers owns 130 tanks. There is a supply of 90-cubic-foot cylinders handy for deep dives. For shallow work the standard 72s are used. A line of rental gear (except for wetsuits) and possibly an offering of photo equipment are planned for the future. Basic equip-

ment repair is now provided. Again, the visiting diver is reminded to bring the personal gear. It's the easiest, most comfortable way to go.

Jim and his 32-year-old partner, Bill Cass, are enthusiastic divemasters. They are very much turned on by Cayman Brac and Little Cayman and are constantly logging unusual sites. Jim took us to one of those spots along the south wall just outside the reef cut.

At a depth of 85 feet we were led to a wide opening. At the top of the opening was a deep crevasse cutting the wall in two. Lodged in the crevasse was an anchor in a perfectly upright position. It had been dropped by a big ocean-going freighter and was hopelessly pinned. The anchor and a considerable length of chain had to be abandoned.



CARL ROESSLER

It was an incredible sight. Hollywood couldn't have been more dramatic. We recommend it to photographers looking for a unique shot.

By all descriptions Little Cayman is the crown jewel of the three islands. It is almost legendary.

Unfortunately, we didn't see it.

Little Cayman lies only seven miles from the Brac, combined with a roughly equal distance along the coast to the outstanding dive sites on the north side. It's an all-day voyage and to be successful the sea must be with you. It simply was not with us.

This was a major disappointment.

I know a tiny handful of divers who have been lucky enough to visit Little Cayman. They have related stories of incredible drop-offs only 20 feet below

the surface, and they tell us of unspoiled reefs and dazzling visibility. There is the so-called Soda Wreck which lies at 50 feet. This is a freighter, fairly intact, loaded with a cargo of motor vehicles. Brass is said to be abundant and salvageable. Photographers have said conditions are as favorable as they are ever likely to be, that marine life is profuse and various.

"It may be the best dive in the Caribbean," I was once told.

Maybe. But I haven't seen it.

Jim said the Chadimas, who own a fishing lodge at Little Cayman, want to set-up a small dive operation there. This would be a big help. Divers could sail to the island regardless of the weather (within limits, of course), and wait for the sea to play hostess.

The visitor to Cayman Brac is probably as much—if not more—intrigued by the prospect of visiting Little Cayman. It is a strong lure and an even stronger reason to spend time at Cayman Brac. The blow-out we faced isn't easily forgotten.

It is all the more frustrating when one reads the local ads placed by Cayman Energy, Ltd., a British-American enterprise. Cayman Energy is building a multi-million dollar crude oil transshipment facility at Little Cayman. First phase capacity, to be underway later this year, calls for ten million barrels of storage space. The facility is to be combined with a big deep water port.

Cayman Energy's promo says the project will bring jobs and money to the islands, and will have the dual "advantage" of offering shipping cost savings ultimately affecting American consumers.

"We are proud," says Cayman Energy, "that Caymanian 'men of the sea' are playing and will play increasingly important roles as partners with Cayman Energy, Ltd."

Such is the language of progress. But you must understand that divers are bound to worry—just a little.

Though I haven't seen it I have no doubt that Little Cayman diving is every bit as good as they say it is. I have flown over the island and all the suggestions of clear water and rich reefs are indicated, even from a perch in the sky. But the island is soon to be transformed. We hope for the best, but you must forgive us if we fear a spill. Cayman Energy assures us this won't happen. But even now, with the facility yet to be completed, the beaches of Cayman give up evidence of ballast wash. It isn't extensive but it is no less unsettling.

Supertankers give me bad dreams. I think it's that way for all of us who love the islands and their graceful waters.

The night before we departed I was in the beach bar quietly sipping a greenie. Winston's lovely young wife, Leslyn, came up to me and smiled.

"Did you enjoy your stay?"

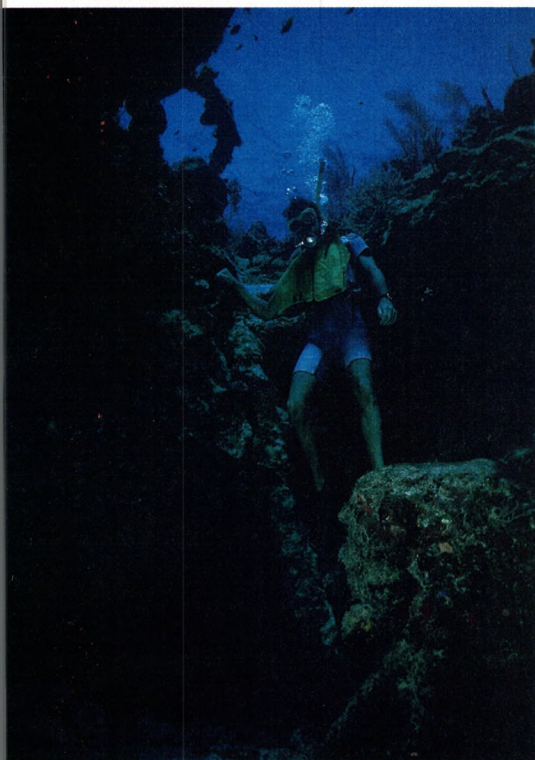
"Yes, very much."

"Will you come back to visit us?"

I thought about it for a moment. I was still annoyed about missing Little Cayman. "If I can," I said. "I travel quite a lot."

Leslyn studied my expression. I had the impression I could hide nothing from her.

"Yes," she said. "I think we may see you again."

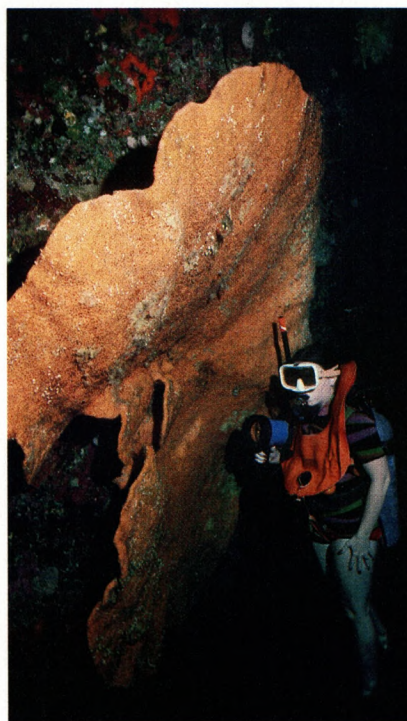


PAUL HUMANN

Facing page: The Little Cayman Wall rises in places to within 20 feet of the surface. Left: A huge anchor abandoned by an oceangoing freighter in Little Cayman's Bloody Bay. Below left: An orange frogfish on Cayman Brac's south wall. Below: A massive orange sponge off Little Cayman.



CARL ROESSLER



CARL ROESSLER

SPORT DIVER DESTINATION DATA

CAYMAN BRAC & LITTLE CAYMAN

GENERAL

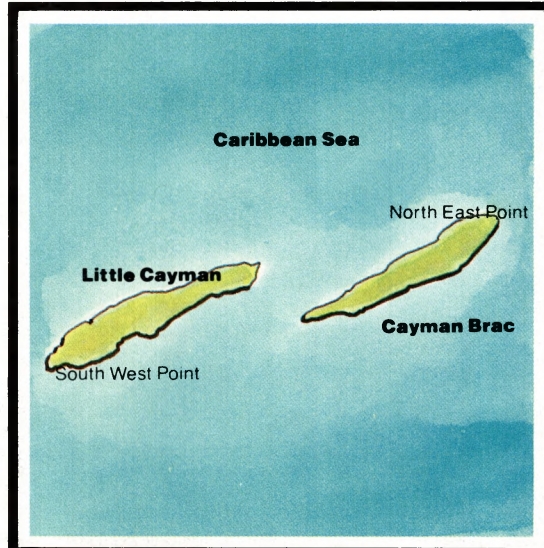
Location: Brac: 89 miles northeast of Grand Cayman; Little Cayman: 84 miles northeast of Grand Cayman
Size: Brac: 14 square miles; Little Cayman: 10 square miles
Topography: flat islands with sloping beaches
Climate: tropical with 60 inches of precipitation annually
Population: Brac 1400, Little Cayman 21
Largest towns: capital Stake Bay, (pop. 65)
Language: English
Ethnic composition: mixed 85%, European 15%
Economy: 25% tourism, 75% seamen
Monetary unit: Cayman dollar = \$0.80 to \$1.20
Diving season: year-round
Tourist season: year-round

DIVING

Water temperature: winter 78°-80°, summer 80°-85° F
Visibility: 120-130 feet, rainy season May-Oct reduces visibility to 80-100 feet
Depth of dives: 30-100 feet
Currents: 1-3 knots
Tidal fall: 1½ feet
Types of diving: reef, wreck, wall, night, beach
Skill level: novice, intermediate, advanced
Dives per day: 3
Diving craft: good
Sights:
Fish: butterfly, french grunt, parrot, french & gray angel, queen angel, tang, rock beauty, stonefish, barracuda, squirrel
Coral: elkhorn, staghorn, star, brain, finger, gorgonia, black, pink
Sponges: tube, basket, vase
Shells: conch, flamingo tongue, cowrie
Invertebrates: sea cucumber, sea star, octopus, worms
Other: shark, ray, jack, tarpon
Restrictions: no collecting or fishing with scuba gear; no lobster March through September; spearfishing only without air, limit three fish or lobsters per day.

DIVING SERVICES

Instruction available: resort course
Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge, depth gauge, compass, decompression meter, knife, dive light, dinghies
Equipment sales: none
Equipment repair: good
Camera repair: fair
Air: to 3500 psi
Guides: good



CAYMAN ISLANDS

DIVERSIONS

Ground transportation: (Brac only) bus, taxi, rental car, motorbike, bicycle
Shopping: fair and reasonable
Restaurants: fair and inexpensive, average meal \$7.00
Nightlife: fair
Other sports: sailing, fishing, tennis, water skiing
Don't Miss: Brac: Southside Bluff, caves, light-house; Little Cayman: South Hole Sound, Bloody Bay Wall, land-locked tarpon lake

JUST IN CASE...

Hospitals: Cayman Brac Faith Hospital, Cayman Brac, ph: 8-2243.
Diving doctors: Dr. James Poilson, Cayman Clinic, George Town, Grand Cayman, ph: 9-4234 (30 min. by air)
Recompression facilities: Cayman Clinic, George Town, Grand Cayman, ph: 9-4234 (30 min. by air)
Police: ph: 8-8223
Marine Rescue: UHF Channel 6; CB Channel 13
American Express: Bank of Nova Scotia, George Town, Grand Cayman, ph: 9-2381
U.S. Consulate: none

PLANNING

Diving tours: Brac Reef Hotel, Cayman Brac, ph: 8-7323, P.O. Box 25175, Tampa, FL 33623; Buccaneer's Inn, Box 68, Cayman Brac, P.O. Box 15465, Baton Rouge, LA 70815, ph: (800) 535-9968
Land tours: taxis available
On your own: Airlines—Red Carpet Airlines, St. Petersburg-Clearwater Airport, Clearwater, FL ph: 800-237-3803; 813-996-4944
Airports—Brac: Gerrard Smith Airport; Little Cayman: Edward Bodden Airport
Cruise lines: none
Marinas: none
Accommodations: Brac Reef Hotel, Cayman Brac, ph: 8-7323; Buccaneer's Inn, Box 68, Cayman Brac, ph: 1-800-535-9968; Kingston Bight Lodge, Little Cayman, ph: 8-3244; Dillon Cottage, Little Cayman; Little Cayman Resort, Little Cayman
Campgrounds: none
Customs and Immigration: Requirements—passport or U.S. citizens may present birth certificate or voter registration
Import restrictions: illegal drugs prohibited
How much cash may you bring into the country? no limit
Export restrictions: no tropical fish or natural Caymanite
How much native currency may you take out of the country? no limit
U.S. Customs re-entry restrictions: no agricultural products or uncertified turtle products

Where a notation "fair," "good," or "excellent" appears after an item, such as guides or diving craft, it refers to the *availability* not the quality of the services.

CAYMAN ISLANDS in brief

GENERAL—The Cayman Islands, Grand Cayman, Cayman Brac, and Little Cayman are friendly islands, according to some, the friendliest in the Caribbean. Christopher Columbus dubbed the islands "Las Tortugas" in honor of the tortoises which abounded them in 1503. However, it is the sun, sand and sea that make the Caymans one of the most popular destinations in the world. The natives smile everywhere you go, the temperature is always around 85 degrees and the water incredibly clear and warm. Such an environment makes the Cayman Islands a water sports paradise. The islands are completely surrounded by a protective barrier of pure, living coral, creating the calmest and clearest waters anywhere in the Caribbean. Besides excellent fishing, sailing and boating, the Cayman Islands are one of the top diving destinations in the world. Anyone who worships the sun, sand, and sea will find anytime is a good time to visit the Cayman Islands.

FACTS—Land Area (all islands): 100 sq. mi; Status: British Crown Colony; Government: British Governor with Executive Council and Legislative Assembly; Population (all islands): 14,000; Time Zone: Eastern; Telephone area code: overseas operator.

TRANSPORTATION—*Air*: Owen Roberts Airport on Grand Cayman is served from North American gateways by Cayman Airways, LACSA, and Southern Airways. Services from Jamaica by Air Jamaica and Cayman Airways. Services from Costa Rica by LACSA. Gerrard-Smith Airport on Cayman Brac is served from North American gateways by Red Carpet Flying Service. Inter-island travel serviced by Trans Island Airways and Executive Air Services Ltd. *Transfers*: to Georgetown; 7 miles. By taxi, about 10 minutes, \$3.75. A local ordinance forbids hotels to pick up guest at airport unless property is more than 20 miles away. *Car Rental*: Avis, Hertz, National and local companies available at airport, in town and at some hotels. *Sea*: Cruise ships have just discovered the Cayman Islands, and service is irregular, although 1978 showed a 4.5 percent increase in cruise ship passengers.

Entry Requirements—Proof of citizenship and return or onward ticket for U.S. and Canadian citizens.

Customs Regulations—U.S. residents allowed \$100 duty free exemption, if out of U.S. at least 48 hrs; one quart liquor. Film, perfume for personal use. Canadian residents may claim up to 40 ozs. of alcohol, 200 cigarettes, 50 cigars and 2 lbs. of tobacco.

Currency—Monetary Fund parity of the Cayman Islands dollar to the U.S. dollar is fixed at CI\$1.00-U.S.\$1.20.

Departure Tax—\$3.00 for visitors 12 years and up. \$2.00 tourist tax for cruise ship passengers.

Taxi Rates—are fixed by Cayman Island Taxi Cab Association. Rates are one-way and allow maximum of 4 passengers.

Public Transit—Buses operate on an hourly schedule, with fares up to 75 cents. Charter buses available for all-island tours, \$40.

Cycles-motorcycles CI\$7.50/day; mopeds CI\$6/day; bicycles CI\$2.50/day.

WEATHER/DRSS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Av. daily high	76	75	76	78	83	84	85	86	85	83	80	78
Av. daily low	68	67	69	70	75	76	76	75	74	74	70	71
No. days with .01 rain	1.5	1.2	.28	5.6	10.8	4.2	5.3	3.1	2.9	2.3	3.2	2.8

Casual comfort in clothing will help make your stay more enjoyable. Whether you are here for business or pleasure, dress for the weather. For women the answer is cotton dresses, blouses and shirts for day wear and a bit dressier for evening wear. Men will do well with casual but neat slacks or shorts and cotton short sleeve shirts for daytime. Suits, if worn, are lightweight and seldom seen out of the office. Of course your itinerary has a lot to do with what you pack, but two things not to forget are sunglasses and bathing suit.

FOR MORE INFORMATION—The Cayman Islands Department of Tourism will help plan and promote group visits. It will provide brochures, flyers, folders and other promotional literature from the main office or one of the following representatives:

Malka Mor
420 Lexington Ave. #2312
New York, NY 10017
(212) 682-5582

Susan Wincher
250 Catalonia Avenue #604
Coral Gables, FL 33134
(305) 444-6551

Mary Lou Wenger
Cherry Creek Office Bldg.
Suite 204
Homewood, IL 60430
(312) 957-9750
Brent O'Brien
9999 Richmond Ave. #131
Houston, Texas 77042
(713) 977-0604

Other offices located in London, Toronto and George Town

DIVE CAYMAN



A World of Undersea Worlds

Whether you are an experienced diver, or making your first checkout in open water, few undersea worlds offer the variety of experiences as the Caymans.

Rated by authoritative sports publications, as one of the top dive areas in the world, with enough different sites and conditions to fill a dozen log books. And they are all close by. No long trips to reach them.

More qualified dive masters than any islands in the Caribbean. Dive shops with complete rental gear. A two man recompression chamber on Grand Cayman.

Dive lodges on the water. Cruises. Apartments. Beachfront hotels. Luxury clubs and villas.

An hour's flight from Miami. Less than 3 hours from Houston, Texas on Cayman Airways. For information and reservations call your travel agent or (305) 444-6551.

CAYMAN ISLANDS
DEPARTMENT OF TOURISM
250 Catalonia Avenue
Coral Gables, FL 33134

BRAC REEF HOTEL/MAELSTROM DIVERS— CAYMAN BRAC ISLAND

Cayman Brac, B.W.I. Phone: 8-7323.

RESERVATIONS: Brac Reef Hotel, c/o Maelstrom Divers, Cayman Brac, B.W.I. Phone 8-7323. Or Red Carpet Airlines, St. Petersburg/Clearwater Airport, Clearwater, Fla. Phone: (813) 535-5541.

LOCATION—Hotel is on south side of island on 400' white sand beach, overlooking the ocean. Three minutes from airport.

TRANSPORTATION—Air: Red Carpet from St. Petersburg, Cayman Airways, Trans Island Air from Grand Cayman. Ground: courtesy car pick-up, car rentals at hotel.

ACCOMMODATIONS—28 air-conditioned carpeted double rooms. Each with balcony, private bath and fresh water shower. Oceanfront dining room, 2 bars and live entertainment. Complete sports program includes tennis, volleyball, ping pong, fishing (bone/deepsea), water-skiing, boating and snorkeling. Island tours, shopping, lighthouse trips and picnics available. Rates: Single \$62-69, double \$80-93, Triple \$100-113, Quad \$120-133 (all rates MAP). 10% gratuities, 5% room tax. Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef yes

Mid reef yes

Deep reef yes

Walls yes

Wrecks yes

Caverns yes

Drift dives yes

Night dives yes

Beach dives yes

DIVING EQUIPMENT—Worthington compressor, 5000 PSI. 130 tanks 72 cu/ft. 2 new Robertson custom dive boats, 22' diver capacity 8, 32' diver capacity 25. Limited retail sales and rentals. Equipment repair on premises, film in stock, 72 hr. film processing.

DIVING SERVICES—PADI, YMCA affiliation. 2 instructor/divemasters, CPR first aid trained. Resort course \$100, full certification \$200, other courses upon request. Cost half day diving (2 tanks) \$20, full day (3 tanks) \$30, night dive \$15. All day Little Cayman trip available.

DIVING PACKAGES—4 days/3 nights \$229, 5 days/4 nights \$299, 8 days/7 nights \$484. Rates per person double occupancy, MAP. Includes accommodations, 2 meals/day, free night dive, maid service, tennis, airport transfers and other options. Non-diver rates available.

OUTSIDE THE REEF



INSIDE THE REEF



ON CAYMAN BRAC IT IS THE



BRAC REEF
HOTEL

and



Maelström
Divers, Ltd.

BUCCANEERS' INN/BRAC AQUATICS— CAYMAN BRAC ISLAND

P.O. Box 68, Cayman Brac, B.W.I. Phone: 8-7257.

RESERVATIONS: Buccaneers' Inn, P.O. Box 685, Land O'Lakes, FL 33539. Phone: (813) 996-4944. Outside FL (800) 237-3803. Or Tropical Escapes, P.O. Box 15465, Baton Rouge, LA 70815. Phone: (504) 272-8990.

LOCATION—Inn is 5 acre property on northwest side of island with 200' waterfront. 3 minutes from airport, 3 miles from town.

TRANSPORTATION—Air: Red Carpet Air from St. Petersburg, Cayman Airways, Trans Island Airways from Grand Cayman. Ground: courtesy car pickup, car rentals at Inn.

ACCOMMODATIONS—Thirty-four air conditioned, carpeted double rooms with private bath and patio or balcony. Inn has two duty free shops, liquor store, swimming pool, dining room, bar with live entertainment. Fishing, sailing, volleyball, darts and croquet available. Rates: single \$40-50 (summer), \$45-60 (winter), double \$70-80 (summer), \$75-90 (winter), triple \$21 extra (summer), \$22 extra (winter). Includes three meals daily and transfers. 15% gratuities and 5% room tax extra. Visa accepted.

DIVING AVAILABLE—

Shallow reef yes

Mid reef yes

Deep reef yes

Walls yes

Wrecks yes

Caverns yes

Drift dives yes

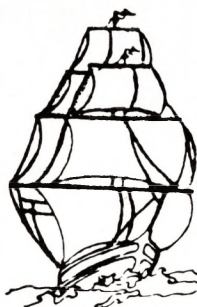
Night dives yes

Beach dives yes

DIVING EQUIPMENT—Two Worthington compressors, two Mako compressors, 3000 PSI. 140 steel tanks 72 cu/ft, 80 aluminum tanks 80 cu/ft. Three dive boats include 42' Trimaran, 41' and 28' custom fiberglass, total eighty diver capacity. Complete rental gear, limited equipment repair, film in stock.

DIVING SERVICES—YMCA affiliation. One instructor, three divemasters CPR first aid trained. Resort course \$50. Cost half day diving (2 tanks) \$25, full day Little Cayman dive (2 tanks, lunch) \$32, beach diving (1 tank) \$4.50. Tank, bac pac, weight belt included in rate.

DIVING PACKAGES—All diving guests receive 20% discount off above prices. A variety of combination packages available at address above, write for details.



Buccaneer's Inn
Brac Aquatics, Ltd.
Cayman Brac, B.W.I.

A REFUGE ...
NOT A RESORT



BOB SOTO'S DIVING LODGE— EAST END, GRAND CAYMAN ISLAND

P.O. Box 894, Grand Cayman, B.W.I. Phone: 9-2483.

RESERVATIONS: Bob Soto's Lodge, c/o Elita Soto, P.O. Box 894, Georgetown, Grand Cayman, B.W.I. Phone overseas operator: 9-2483.

LOCATION—Lodge is located on southeast end of island, directly on the waterfront and beach. 21 miles from airport in center of East End.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern, from Miami, Red Carpet Air from St. Petersburg. Ground: taxi from airport CI\$20 for two people, courtesy bus pickup for groups, car rentals in town.

ACCOMMODATIONS—17 rooms, 6 with air conditioning, others with oscillating fan. Lodge has continual sea breeze, porches overlook ocean. Restaurant on premises, bar next door. Sailing, fishing, waterskiing, tennis, all available upon request. Rates \$35 per person per day (Summer) 10% service charge, 5% government tax, major credit cards accepted.

DIVING AVAILABLE—

Shallow reef **yes**
Mid reef **yes**
Deep reef **yes**

Walls **yes**
Wrecks **yes**
Caverns **yes**

Drift dives **no**
Night dives **yes**
Beach dives **no**

DIVING EQUIPMENT—Mako K15 compressor, 3000 PSI. Fifty-four 72 cu/ft tanks, 36' new conventional dive boat with walk through platform, diver capacity of twenty. Chevy Bus and Toyota station wagon available to guarantee dive on calm side of island. Full service retail store with rentals.

DIVING SERVICES—All major certifications. One instructor/one dive-master CPR, first aid trained. Resort course \$50, full certification \$150. Cost half-day diving (2 tanks) \$22.50, full day (3 tanks) \$40, night dive \$22.50 (light \$5). Basic gear included in rate.

DIVING PACKAGES—\$35 per person per day. Includes two meals, accommodations, free airport transfers, 2 tank boat dive, basic gear. 20% commissionable to travel agents, group rates for dive shops, Jack McKinney Cayman film available for rent/sale for promotional use. For complete information, contact above address.

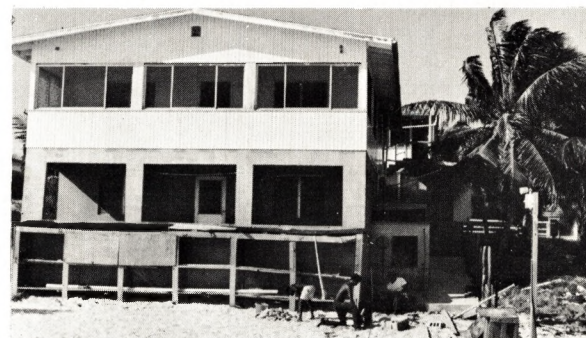
Bob Soto's Lodge

PIRATE COVE, BOX 894, GRAND CAYMAN, B.W.I.



*Serving the
diving industry
since 1953*

DIVE THE MOST
EXOTIC REEFS,
WRECKS, WALLS,
AND DROP-OFFS
IN THE WORLD-
GRAND CAYMAN



CAYMAN DIVER CRUISES— GEORGETOWN, GRAND CAYMAN ISLAND

P.O. Box 1364, Grand Cayman, B.W.I. Phone: (415) 771-0077.

RESERVATIONS: M/V CAYMAN DIVER, c/o See & Sea Travel, 680 Beach St., Suite 340, San Francisco, CA 94109. Phone: (415) 771-0077.

LOCATION—Vessel is docked in Georgetown Harbor behind Soto's Dive Store on west side of island in center of town, 10 minutes from airport.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet Air from St. Petersburg. Ground: taxi from airport \$4, car rentals in town.

ACCOMMODATIONS—Cayman Diver is 83' diving yacht powered by twin diesels. Complete facilities include on-board air bank, compressor, dive platform, gangway, gear storage, freshwater rinse, full galley, tanks, bar, 2 private heads, freshwater shower, air conditioned sleeping quarters (3 double staterooms, 1 six-berth stateroom) and 650' of open deck. Electronic equipment includes 2 ship to shore radios, depth sounder, stereo system, and automatic direction finder. Rate: \$700/week all inclusive except air fare, taxes, drinks and gratuities.

DIVING AVAILABLE—

Shallow reefs **yes**
Mid reef **yes**
Deep reef **yes**

Walls **yes**
Wrecks **yes**
Caverns **yes**

Drift dives **no**
Night dives **yes**
Beach dives **no**

DIVING EQUIPMENT—2 Mako compressors, 3000 PSI. 16 tanks 72 cu/ft. Total diver capacity of 12. Tanks, bac pac, weight belt and linen provided. Suggest bringing personal dive gear, cameras and film.

DIVING SERVICES—Accept all major certifications. 3 instructors and 3 divemasters CPR first aid trained. Live aboard dive cruise especially suited for U/W photographers and divers who want unlimited diving. Divemasters serve as guides but basically divers are on their own.

DIVING PACKAGES—8 days/7 nights \$700. All inclusive from arrival to departure includes transfers, boat cruise, three meals/day, basic gear and unlimited air. Special cruise to Honduras, Roatan and Bay Islands each September, \$900. Applications and information forms are available from See & Sea Travel.

Enjoy the Cayman Islands Finest and Most Complete Diving Program



Live aboard the 83 foot M.V. Cayman Diver.

- Truly unlimited diving
- Explore the dive sites that are beyond the range of hotel-based packages
- Fine food, capable crew
- 7 years of excellent service to the high-quality diving market
- Special group charters available for dive shops and clubs



For further information:

See & Sea
TRAVEL SERVICE, INC.

680 Beach St.
Suite 340/Wharfside
San Francisco, California 94109
Telephone: (415) 771-0077

CAYMAN KAI RESORT— NORTH SIDE, GRAND CAYMAN ISLAND

P.O. Box 1112, Grand Cayman, B.W.I. Phone: 7-2573.

RESERVATIONS: Hotel Plans Inc., 1301 W. 22nd St., Oak Brook, Ill. 60521. Phone: (312) 887-8088.

LOCATION—Resort is on 400 acre property with 5 miles of waterfront on north coast of island. 26 miles from airport and town.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet Air from St. Petersburg. Ground: taxi from airport \$26, courtesy pickup with 3 or more night stay, car rentals at resort.

ACCOMMODATIONS—26 one and two bedroom sea lodges, 20 one to four bedroom beach villas with spacious bath, kitchen, living and dining rooms, porch and patio. Some villas with air conditioning. Resort has restaurant, bar, weekly entertainment, waterskiing, tennis, boating and fishing. Rates: lodges, single \$40 (summer), \$70 (winter), double \$75 (summer), \$132 (winter), villas, double \$59-98 (summer), \$72-150 (winter). Amex, Visa and MasterCard accepted.

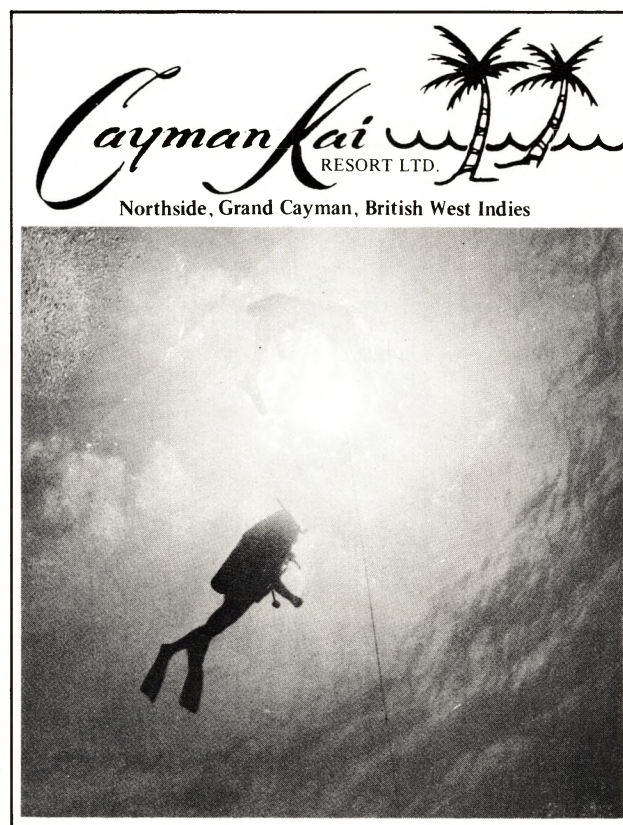
DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives yes
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns no	Beach dives no

DIVING EQUIPMENT—Mako and Worthington compressors, 5000 PSI. 100 tanks 72 cu./ft. 4 dive boats include 26' Flattop with 20 diver capacity, 3 Aquasports with 8 diver capacity each. Full retail sales and complete line of rental gear. U/W camera \$15/half-day, U/W flash \$18/half day, film in stock, limited camera repair.

DIVING SERVICES—PADI, NAUI affiliation. 4 instructor/divemasters CPR first aid trained. Resort course CI\$45. Cost half day diving (1 tank) CI\$12.50, full day diving (2 tanks) CI\$25, night dive CI\$17.50. Boat, divemaster and basic gear included in rate.

DIVING PACKAGES—8 days/7 nights \$420 (summer), \$525 (winter), 4 days/3 nights \$190 (summer), \$211 (winter), rate per person double occupancy. Includes accommodations, 2 meals daily, maid service, two dives daily, airport transfers, welcome drink and other options. Non diver allowance available. IT9EA1 4000.



GALLEON BEACH HOTEL/ SURFSIDE WATER SPORTS— 7 MILE BEACH, GRAND CAYMAN ISLAND

P.O. Box 71, Grand Cayman, B.W.I. Phone: 9-2692.

RESERVATIONS: Galleon Beach/Surfside, P.O. Box 71, Grand Cayman, B.W.I. Phone: 9-2692. Or Richard Dixon, P.O. Box 891, Grand Cayman, B.W.I. Phone overseas operator: 9-2724.

LOCATION—Resort is on Seven Mile Beach with 450' oceanfront property on west side of island. 15 minutes from airport and town.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet Air from St. Petersburg. Ground: taxi from airport \$6, car rentals at hotel.

ACCOMMODATIONS—Twenty-seven oceanfront double air conditioned rooms with private bath, all with balconies or patio. Two 3 bedroom suites available with 3 baths, living room, dining room, and kitchen. Hotel has restaurant, bar, lighted tennis court, lounge with nightly entertainment, disco bar and 2 beach bars. Watersports include glassbottom boat, snorkeling, fishing, waterskiing and boating. Rates: single \$27 (summer only), double \$35 (summer), \$50-75 (winter), triple \$45 (summer), \$60-85 (winter), suites \$125 (summer), \$225 (winter). Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives no
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns no	Beach dives yes

DIVING EQUIPMENT—Mako compressor, 3000 PSI. 125 steel and aluminum tanks, 72 cu./ft. 3 dive boats include 34' Trimaran, 28' and 24' SeaTruk with 50 diver total capacity. Full retail sales and complete rental gear. Basic gear in dive rate. Film in stock, 24 hr. processing available.

DIVING SERVICES—PADI affiliation. 2 instructors and 2 divemasters, CPR first aid trained. Resort course \$60, full certification \$250, other courses on request. Cost half day diving (2 tanks) \$25, full day (3 tanks) \$45, night dive (w/light) \$25.

DIVING PACKAGES—Special package price available with hotel and watersports center. Please inquire at above address.



THE ROYAL PALMS HOTEL— 7 MILE BEACH, GRAND CAYMAN ISLAND

P.O. Box 490, Grand Cayman, B.W.I. Phone: 9-2636.

RESERVATIONS: The Royal Palms of Cayman, P.O. Box 490, Georgetown, Grand Cayman, B.W.I. Phone overseas operator: 9-2636, Telex: CP237. Or Robert Reid Associates Inc., New York, N.Y. Phone toll free: (800) 223-6510.

LOCATION—Hotel is located on 300' oceanfront at Seven Mile Beach on west side of island. Property is four acres, five minutes from Georgetown and ten minutes from airport.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet Air from St. Petersburg/Clearwater Airport. Ground: Taxi from airport \$5.75 (a local ordinance forbids Grand Cayman resorts to pick up guest at airport). Major car rentals at hotel and downtown.

ACCOMMODATIONS—Sixty two air conditioned rooms with private bath. Includes forty apartments with either one or two bedrooms, kitchen facilities and porch or balcony. Telephones in all rooms. Hotel's complete features include English Pub with dart board, jukebox, poolside bar, terrace restaurant, theatre club, meeting rooms with sound and movie equipment, mini supermarket, boutique, full retail service dive store, baby cribs and babysitting, freshwater swimming pool and tennis courts available. Watersports center offers waterskiing, deepsea fishing, sailing, glassbottom boat trips, snorkeling and one hour cruise on authentic replica pirate ship. Rates: apartments, single \$40-45 (summer), \$62-73 (winter), double \$46-52 (summer), \$68-79 (winter), triple \$52-58 (summer), \$74-85 (winter), quad \$58-64 (summer), \$80-92 (winter). Rooms, single \$26-32 (summer), \$46-54 (winter), double \$32-38 (summer), \$52-60 (winter), triple \$38-44 (summer), \$58-66 (winter), quad \$50 (summer), \$72 (winter). 15% service charge and 5% room tax extra. Group rates apply to fifteen or more people, one room free for every fifteen paid. One apartment free for every ten paid. All major credit cards accepted.

DIVING AVAILABLE—

Shallow reefs **yes**
Mid reef **yes**
Deep reef **yes**

Walls **yes**
Wrecks **yes**
Caverns **yes**

Drift dives **no**
Night dives **yes**
Beach dives **yes**

DIVING EQUIPMENT—Mako K15 compressor, 3500 PSI. One hundred tanks, fifty 72 cu./ft., fifty 80 cu./ft., all aluminum. Three dive boats include 36' diving barge with front load entry and exit, 24' ski barge, 46' sailboat with total fifty diver capacity. Full line retail store and complete line of rental equipment. Rental rates include tank bac/pac \$5/day, regulator with gauge \$5/day, weight belt \$2.50/day, mask, fins, snorkel \$4/day, safety vest \$2.50/day, buoyancy compensator \$3.50/day, depth gauge \$1/day and underwater light \$5/day. Film in stock both at store and downtown, twenty four hour film processing available and minor camera repair available. Dive sites are short boat ride from hotel, simply notify shop you are diving and show up at beach on time. Boats leave directly from beach in front of hotel.

DIVING SERVICES—PADI, NAUI, YMCA affiliation. Four instructor/divemasters who are CPR first aid trained. Resort course \$50, full certification \$205, snorkel course \$15, swimming lesson \$7.50, advance courses on request, YMCA instructor course held annually last week in September and underwater photography course available on request. Cost half day diving (1 tank) \$15, full day diving (2 tanks) \$25, night dive \$22.50, all day diving safari (3 tanks) \$30, Northwall or Southwall dive (2 tanks) \$25 and half day snorkel trip \$8. Tanks, bac pac, weight belt included in rate. All divers must show c-card, divers forgetting c-card are treated as non divers, must take introductory course and will be allowed only on shallow dives. All divers must wear flotation device and pressure gauges. Dives preplanned to insure maximum bottom time, complete briefing before dive to determine individual skills and desires. We pride ourselves on offering safe personalized and professional diving services.

DIVING PACKAGES—SCUBA PACKAGE: 7 days/6 nights \$378 single, \$636 double. Includes poolside accommodations, two meals/day, four two tank dives, boat trip, weight belt, tank, bac pac and air. DIVE GROUP PACKAGE: applies to groups of fifteen or more people, one person complimentary for every fifteen people paid. 3 nights/two 2 tank dives \$215 single, \$168.50 double, \$153 triple, \$146, quad. 6 nights/four 2 tank dives \$430 single, \$337 double, \$306 triple, \$292 quad. Includes poolside accommodations, two meals/day, all service charges and room taxes, two tank dives daily, tank, weight belt, bac pac, boat trip and guide. Packaged dives cannot be used for night dives or special trips, packaged dives are not transferable or refundable. Other special packages include honeymoon package, vacation package, unlimited diving package and travel personnel package. Above packages commissionable at 10%. For complete information write to above address.



SPANISH BAY REEF RESORT— NORTHWEST, GRAND CAYMAN ISLAND

P.O. Box 800, Grand Cayman, B.W.I. Phone: 93765.

RESERVATIONS: Spanish Bay Reef Resort, P.O. Box 16531, Irvine, CA 92714. Phone: (714) 540-9455. Telex: TAB IRIN 678401. Or Spanish Bay Reef Resort, P.O. Box 800, Grand Cayman, B.W.I. Phone overseas operator: 9-3765. Telex: 203 SBRRS CP.

LOCATION—Resort is on northwest shore of Grand Cayman in area known as Spanish Bay, adjacent to the famous North Wall Reef. Facility is on oceanfront with beaches and lagoon. Remotely located but only 15 minutes from airport, 10 minutes from Georgetown.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet Air from St. Petersburg/Clearwater. Ground: taxi from airport \$12 (a local ordinance forbids Grand Cayman resorts to pick up guests at airport), courtesy return ride to airport, car rentals available at resort.

ACCOMMODATIONS—Twenty-five private bungalows by the ocean, each spacious with its own cathedral ceiling, individual deck, and luxurious furnishings. Air conditioning is available, ceiling fans throughout. Main building is two stories and houses dining room and bar. Dining room has 100 capacity, oceanfront view, unique menu. Bar and lounge are on second level overlooking the ocean. With wall to wall circular saltwater aquarium. Lounge has complete audio visual equipment for weekly movies and slides. Complimentary hors d'oeuvres in lounge after night dives. Balcony overlooks patio, barbecue and pool. Rates: single \$40 (EP), \$55 (MAP), \$60 (FAP) summer, \$65 (EP), \$80 (MAP), \$85 (FAP) winter, double \$50 (EP), \$80 (MAP), \$90 (FAP) summer, \$75 (EP), \$105 (MAP), \$115 (FAP) winter. American Express, Visa and MasterCard accepted.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives no
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns yes	Beach dives yes

DIVING EQUIPMENT—Worthington and Mako compressors, 3500 PSI. 100 tanks 72 cu./ft. 3 dive boats include two 34' Bristol flattops powered by twin Evinrude 175 outboards. Flattops have individual seating, gear storage, sunroof and center tank racks. Each vessel carries crew of 3 that includes captain, mate and divemaster. 36' Striker completes fleet. All boats are linked to resort with VHF radio. Total diver capacity of 60. No retail sales, complete line of rental gear includes mask, fins, snorkel \$3/day, tank/bac pac \$5/day, regulator with gauge \$5/day, buoyancy compensator \$3/day, weight belt \$2/day, U/W light \$5/day, depth gauge \$2/day, U/W timer \$10/day, U/W camera \$20/day. Camera repair, film and 24 hour film processing available.

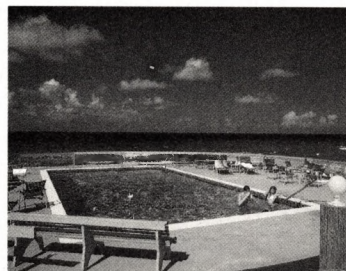
DIVING SERVICES—PADI, NAUI, NASDS, SSI, YMCA affiliation. Three instructors and two divemasters who are CPR first aid trained. Staff undergoes constant in-service training for safety. Resort course \$60, full certification \$225, U/W photography course \$210, U/W Marine Biology course \$80. Cost half day diving (1 tank) \$20, full day diving (2 tanks) \$35, night dive \$20. Tank, bac pac, weight belt included in dive rate. Dives are preplanned for maximum time underwater, complete briefing before dive to determine individual skill level and desires. Dive sites are short boat rides from dock.

DIVING PACKAGES—7 days/6 nights single \$601, double \$499, non divers double \$302. Includes six days with two tank dives, accommodations, availability of all hotel facilities including isolated sand beach, freshwater swimming pool and scheduled underwater film and slide shows. Gratuity on rooms, meals and diving is included. 5% government room tax also included as well as return transfer to airport. Special group diving package available to groups of 15 or more. Features include accommodations for 50 divers (double occupancy), exclusive use of dive boat with experienced captain and crew plus divemaster, exclusive use of air conditioned classroom with visual aid equipment and recording apparatus, exclusive use of photo darkroom and processing laboratory, semi-private seating area in dining room, Rum Punch Welcome Party with staff introduction and general orientation, availability of telephone and Telex communications plus local transportation. Special programs include underwater photography courses with Jim and Cathy Church. Course offers individual instruction, practical techniques, critical analyses, and complete line of photo equipment for student use. Other programs include Tropical Reef Biology for divers which carries college credit. Underwater Archaeology seminars are held periodically. A minimum deposit of \$200 per person is required at the time of the booking to hold the reservation. The balance is to be paid in full 30 days prior to the arrival date. This package offer is good through December 20, 1979. Individuals cancelling 30 days or less prior to arrival will forfeit 50% of their deposit. The cancellation charge will be waived if accommodations are resold.

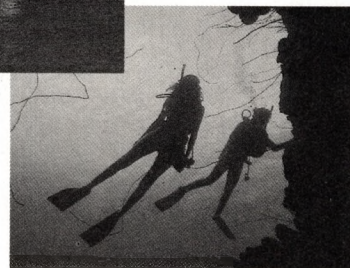
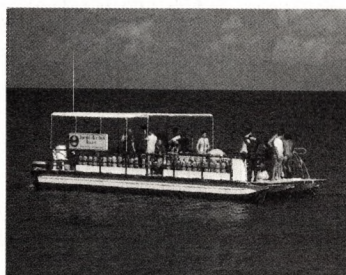


SPANISH BAY REEF RESORT

THE OUSTANDING RESORT
FOR DIVERS IN THE CAYMAN ISLANDS



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THE WATER
SPANISH BAY REEF
HAS MORE TO OFFER



SPANISH BAY VILLAS— NORTHWEST, GRAND CAYMAN ISLAND

P.O. Box 1200, Grand Cayman, B.W.I. Cable: Bayvill.

RESERVATIONS: Cayman Islands Reservation Service, 250 Catalonia Ave. #604, Coral Gables, FL 33134. Phone toll free: (800) 327-8777 (except Fla. (800) 432-4858). Or address above.

LOCATION—Villas are on northwest shore of island, adjacent to Spanish Bay Reef. 20 minutes from airport, 15 minutes from town.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet Air from St. Petersburg. Ground: taxi from airport \$12, rental cars, mopeds and bikes available on request.

ACCOMMODATIONS—Twelve apartments, either one or two bedroom. Completely furnished, all electric kitchens, ceiling fans throughout, with private deck or patio. All apartments face the sea and thatched cabana. Freshwater swimming pool, restaurant and bar privileges at adjacent resort for all guests. Rates: \$48 (EP) for 2 people in one bedroom apt. \$72 (EP) for 4 people in two bedroom/bath apt. Amex, Visa, MasterCard accepted.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives no
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns yes	Beach dives yes

DIVING EQUIPMENT—Worthington and Mako compressors, 3000 PSI. two dive boats include 34' Bristol flattop, 36' striker with forty total diver capacity. Complete rental gear, U/W camera \$18/day. Camera and strobe repairs, film in stock, 24 hr. Ektachrome processing \$7.50/roll.

DIVING SERVICES—PADI, NAUI, YMCA affiliation. 3 instructors and 2 divemasters. Resort course \$60, full certification \$225, U/W photo course \$210. Cost half day diving (1 tank) \$20, night dive \$20. Rate includes tank, bac pac, weight belt.

DIVING PACKAGES—\$36 per person per day (EP) added to apartment rate. Includes 2 one tank dives daily. Night dive, extra dives available at resort rates. Group dive packages provide one free trip for group of fifteen or more. Write to above address for complete details.



Spanish Bay Villas

CONDOMINIUMS FOR DIVERS



THE TORTUGA CLUB— EAST END, GRAND CAYMAN ISLAND

P.O. Box 496, Grand Cayman, B.W.I. Phone: 7-2488.

RESERVATIONS: The Tortuga Club, P.O. Box 496, Grand Cayman, B.W.I. Phone: 7-2488. Or The Tortuga Club, c/o Marion Barich, 162 Main St., Salinas, CA 93901.

LOCATION—Club is 5 acre property on east end of island with 600' of beachfront. 25 miles from airport and town.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet Air from St. Petersburg. Ground: Courtesy car pickup, rental cars in town.

ACCOMMODATIONS—14 air conditioned double rooms with private bath, freshwater showers and terraces. Club is only hotel on windward side of island, self sufficient with restaurant, bar and lounge. Waterskiing, fishing, tennis, sailing, shuffleboard, and bicycles available. Rates: single \$54, double \$78, price includes 2 meals daily. Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef yes	Walls yes	Drift dives yes
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns yes	Beach dives yes

DIVING EQUIPMENT—Worthington and Mako compressors, 3500 PSI. Sixty tanks 72 cu/ft. Three dive boats include 34' custom built diesel, 22' Aquasport, 19' Whaler with total diver capacity of twenty-six. Retail sales and rental gear are available. Underwater camera is \$25 per day, film is in stock and forty-eight hour processing of film is available.

DIVING SERVICES—PADI affiliation. One instructor and two divemasters. Resort course \$55, full certification \$150, advance courses \$50. Cost half day diving (2 tanks) \$29, full day rates available, night dive \$25 (light \$5). Tanks, bac pac, weight belt included in rate, other gear available on request.

DIVING PACKAGES—\$74 single, \$59 double, \$49 quad. Rates are per person per day, two meals daily. Cost of diving included in rate. For complete information on special diving packages, contact above address.

The Tortuga Club

P.O. BOX 496, GRAND CAYMAN, BWI, PHONE 7-2488



SUNSET HOUSE— GEORGETOWN, GRAND CAYMAN ISLAND

South Church Street, Grand Cayman, BWI. Phone: 92511.

RESERVATIONS: Sunset House, c/o Adrian Briggs, Post Office Box 479, South Church Street, Georgetown, Grand Cayman, BWI. Phone overseas operator: 92511, Cable: Sunset.

LOCATION—The hotel and apartments are situated on the leeward (west) side of the island with 450' ocean front. One mile south of Georgetown and five minutes from Owen Roberts Airport.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern Airways from Miami and Cayman Airways from Houston. Red Carpet Air from St. Petersburg/Clearwater Airport. Ground: taxi from airport \$5.50 for two people, major car rentals available at airport, downtown or arranged through hotel.

ACCOMMODATIONS—Thirty-nine air-conditioned double rooms fully furnished with either balcony or terrace. All have private bath, eight units have kitchen facilities. Twelve rooms and two one-bedroom apartments are brand new. Newly constructed restaurant enables hotel to handle one-hundred diners. Complete facilities include main buildings, restaurant, thatched roof oceanfront bar (recently expanded) and complete dive shop. The original house, constructed by local craftsmen 100 years ago of mahogany and hardwoods is still considered a local landmark. Resort is situated within the capital city of Georgetown, renowned for its freeport shopping with duty free items from around the world. Recreational activities include fishing, boating, snorkeling and scuba diving. Rates: rooms, single \$28-33 (summer MAP), \$33-60 (winter MAP), double \$48-55 (summer MAP), \$55-70 (winter MAP), suites with kitchen facilities, sleeps four \$28-45 (summer EP), \$45-65 (winter EP). Thirty-one units can be rented either single or double. Amerex, MasterCard and Visa cards accepted. Fifteen per cent gratuity and five per cent government tax will be added.

DIVING AVAILABLE—

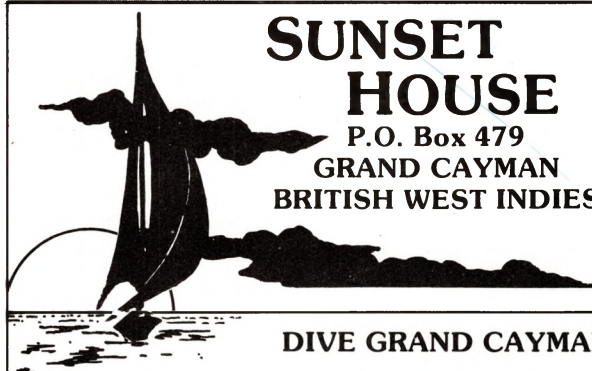
Shallow reef yes	Walls yes	Drift dives no
Mid reef yes	Wrecks yes	Night dives yes
Deep reef yes	Caverns yes	Beach dives yes

DIVING EQUIPMENT—Rix and Worthington compressors, 5000 PSI. Two hundred 72 cu/ft aluminum tanks. Two dive boats include 35' LCVF with a twenty-five diver capacity and 32' launch with a fifteen diver capacity. VHF radio allows vessels to be in constant communication with resort. Full service dive shop is brand new and offers full line of retail sales and all basic equipment for rental use. Rental rates include tank/bac pac \$4.25 per day, mask/snorkel/fins \$2 per day, weight belt with lead .75 per day, regulator with pressure gauge \$4 per day, Underwater light \$5 per day, BC vest \$2.50 per day, Underwater camera rental rate depends on unit chosen. Resort has film in stock, can make minor camera repairs and twenty-four hour Ektachrome photo processing available.

DIVING SERVICES—PADI, BSAC (British Sub Aqua Club) affiliation. Three instructor/divemasters are CPR first aid trained. All instructors are certified and have years of local experience. Resort course, full certification and underwater photography courses available. Rate depends on individual requirements and equipment provided. Cost for half day diving (two tanks) \$20, cost for full day diving (four tanks) dependent on package price and individual requirements, cost for night dive (with light) \$20. Rate includes tank, bac pac, air, weight belts and lead, boat and divemaster. Dives are preplanned to insure maximum time underwater. Complete briefing before dives to determine individual skill level and interest. Boats and dock are short walk from dive shop. All boats have licensed captains and are US Coast Guard approved. Special group requirements such as underwater photography, marine biology, night dives, etc. can be arranged through the resort. Please write in advance for special arrangements. Hundreds of dive sites in the Cayman Islands include the Balboa wreck, Trinity Caves, The Tunnels, Eden Rock Drop Off, Eagle Ray Rock, Tarpon Alley, Armchair Reef, Frank's Reef, Angel Reef and Eden Rocks. The marine life and reef formations of these dive sites are ideal for underwater photographers.

DIVING PACKAGES—4 day/3 night minimum packages are tailored to suit individual and group requirements. Longer stay packages are also available. Price range depends on package. New facility enables hotel to accommodate larger groups. Includes accommodations based per person double occupancy (single rates available, as are non diver rates), two meals daily, gratuities, taxes, tanks, bac pac, weight belt, air, boat, guide and two tanks daily. Also includes airport transfer, unused portions non-refundable. For complete prices, rates and other information, write or call today for free brochure to above reservations address.

SUNSET HOUSE P.O. Box 479 GRAND CAYMAN BRITISH WEST INDIES



Photos: Donald Arneson

UNIVERSAL CHARTERS— GEORGETOWN, GRAND CAYMAN ISLAND

P.O. Box 1369, Georgetown, Grand Cayman, B.W.I. Phone: 9-5848.

RESERVATIONS: Universal Charters, P.O. Box 1369, Georgetown, Grand Cayman, B.W.I. Phone overseas operator: 9-5848 or 9-5773.

LOCATION—Ships are docked in Georgetown Harbor on west side of island. 10 minutes from airport, harbor in center of town.

TRANSPORTATION—Air: Cayman Airways, LACSA, Southern from Miami, Red Carpet from St. Petersburg. Ground: taxi from airport \$3.50, car rentals in town.

ACCOMMODATIONS—*Ports of Call*: 113' luxury motor sail custom designed for divers. 10 air conditioned, carpeted, double staterooms with fresh water and stereo speakers in each. Ship has TV video cassette, stereo tape deck, full galley, dining room and lounge area. Rate: \$125/day per person includes all meals, all diving gear, private room, trips to Little Cayman and Cayman Brac. *Pious Puffin*: 71' luxury ketch sailing vessel for day and night sails. Ship has teak and mahogany wood carvings and stained glass windows throughout. Ideal for moonlight sails, spinnaker flying and short diving trips. Rates: \$15/day, \$25/day with meals, includes hammocks for sunbathing, snorkeling equipment and dinner. No credit cards accepted.

DIVING AVAILABLE—

Shallow reef **yes**

Walls **yes**

Drift dives **no**

Mid reef **yes**

Wrecks **yes**

Night dives **yes**

Deep reef **yes**

Caverns **yes**

Beach dives **yes**

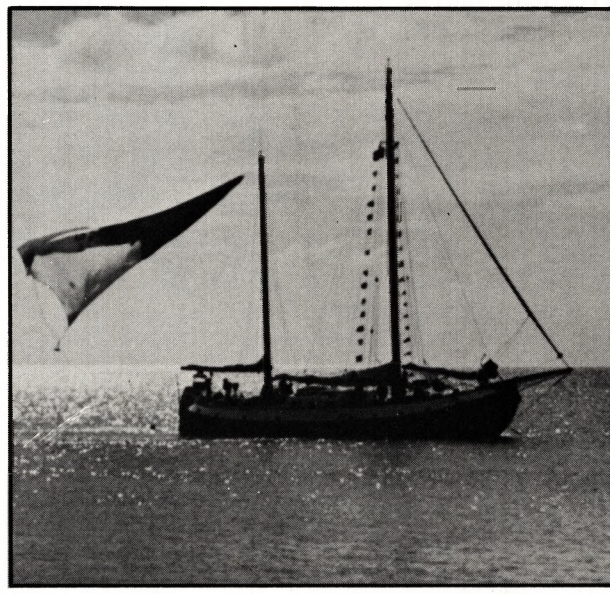
DIVING EQUIPMENT—2 Poseidon compressors, 4500 PSI. 60 tanks 72-cu/ft. *Ports of Call* has motorized dive platform that raises and lowers into water. All diving gear included in rate.

DIVING SERVICES—Accept all major certification. Divemaster is CPR first aid trained. Resort course \$50. Unlimited diving available, all within sport diving limit.

DIVING PACKAGES—*Ports of Call*: \$125 per person per day. 4-6 day charters to Little Cayman and Cayman Brac, all inclusive. *Pious Puffin*: \$25 day for day sail, meals, trip around Grand Cayman. Special packages and charters available on request.

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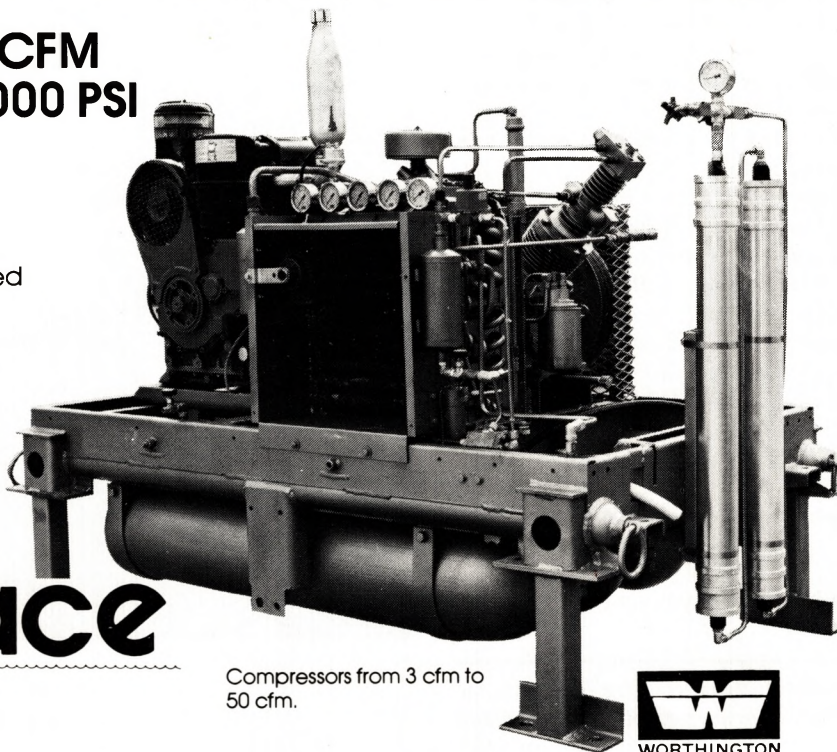
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Compressors from 3 cfm to
50 cfm.



Fins and Flippers

Finding the right footwear for your style of diving will make you more comfortable, more efficient and safer in the water.

BY TOM MOUNT
PHOTOGRAPHY BY
EMILIO RODRIGUEZ JR.

Unlike fish, divers enjoy the option of choosing the type of swim fin best suited to their needs. Given the bewildering array of designs now on the market, finding the right fin can be harder than earning a C-card—and involve more critical decisions. After all, these flexible flukes are your surrogate feet; you're going to depend on them for transportation, control and protection. They'd better be good, fit right and perform as expected in all conditions. Your comfort, or your life, may depend on that.

Before browsing through the dive shop shelves, do some homework. The type of fin you'll want will depend almost entirely on who you are, where you dive and what you wear in the water. An accurate assessment of your physical condition is essential. How often are you in the water? If you stay in shape and dive often, you'll cover more territory with a large power fin. The weekend diver's needs and capabilities call for a less demanding form of propulsion. Consider cramps; a magnificent dive can become a miserable experience if your legs give out before your air does.

Many of us have been misled by advice from well-meaning instructors who characterize the difference between open heel fins and full foot designs as power fins versus swim fins. While in the past this breakdown was fairly accurate, in today's marketplace this is an oversimplification. While there are significant differences in performance, the choice between a power fin and a conventional swim fin cannot be made on the basis of foot coverage.

Open Heel Fins

Open heel fins usually have a more reinforced foot pocket and can therefore

*Tom Mount is a past Training Director of the YMCA's underwater activities program and author of **Practical Diving**, **Safe Cave Diving** and **The Cave Diving Manual**.*



Above: U.S. Divers SuperRockets, \$35.50. Above right: Dacor extra-long full foot fins, \$60; Cressi-Sub 'L' full foot fins, \$33.



Below left: Mares Plana full foot fins, \$29.95. Below right: Sportsways Waterlung fins, \$33.



continued

withstand the stress of more rigid blade areas. For this reason, open heel designs have long been favored for power fins. Quite a variety of open heel designs are available from mini to extra large sizes, many based on the design of the adjustable Scubapro Jet Fin.

Divers who frequently wear full coverage wetsuits may prefer an open heel which allows adjustment for use with or without boots. This versatility is useful to the diver who encounters a wide variety of diving conditions and water temperatures. Remember, though, that open heel designs distribute most of the stress of propulsion across the arch and instep, concentrating stress on a smaller area of the foot. In combination with a stiff power blade, this can mean an earlier onset of leg fatigue unless you're accustomed to an open heel power fin.

Many of the newer open heel designs offer a choice of blade flexibility. Designs such as the Farafin are preferred by many occasional divers because their flexibility is uniform across the blade. Avoid designs that concentrate all flexibility in the last few inches of the fin.

Frequent divers who prefer more propulsion and need a larger blade area now have a choice of extra-long open heel fins. U.S. Divers' Super Rockets, Scubapro Superjets, Dacor's large Turbo, White Stag's Super Stress and Cressi Sub's Commando are all designed for maximum thrust and hard use.

Full Foot Fins

Until recently, many dive instructors would not recommend full foot fins for any type of diving. But with the recent explosion of new models into the market, full foot designs have gained wide acceptance. Because the design distributes stress over the entire foot, including the normally well-developed heel, full foot fins can provide about the same thrust as an open heel design with less muscle fatigue.

Warm water divers who don't wear boots often prefer full foot fins, especially for extended periods in the water. As with open heel designs, a full range of models for various levels of thrust are available, and many divers prefer the snug fit and wrap-around foot coverage of these designs. If you usually dive wearing boots but prefer a full foot fin, some models with extra large foot pocket



Left: Scubapro Rocket open heel fins, \$35. Below: Farallon open heel Farafin, \$39.95. Bottom: Voit Swimmasters A6B Viking, \$24.



sizes will accommodate up to a 1/4-inch boot. A fin two to three sizes larger than you'd normally wear will fit a 3/16-inch boot; a 1/4-inch boot requires an increase of three or four fin sizes.

For the speed swimmer, new designs in full foot fins incorporate the same fit and flexibility with a larger power blade that can deliver as much thrust as open heel power fins. Two exceptional full foot power fins are the Cressi Sub "L" and an extra long model by Dacor. These are both top-of-the-line models and can provide all the thrust you're likely to need. Less extreme power fins with full foot coverage include the Cressi Sub "S," Dacor's full foot Jet Fin, Sportsways' Water Lung fins, Mares, and Swimmasters' A-66 Viking. These are intermediate power fins that provide more propulsion than conventional swim fins without the cumbersome extra-large blade of some all-out power fins.



Froghands

Ducks do it, so why not you, too? These supple, latex rubber sheaths are form-fitting for the ultimate in comfort and webbed for an exciting new experience in wet propulsion. The manufacturer says they are "ultra thin and super stretchy to fit skin tight and give you a great sense of feel," and are "unconditionally guaranteed to increase the power of your stroke." Aqua Hand is \$15.95 from Ocean Motion Research, 281 Arthur Rd., Martinez, CA 94553. You'll love them, and so will she.

Materials

No matter which type of fin you choose, attention to detail in the final selection is as essential as a good fit. Wide variances in materials, assembly and durability exist among commercially manufactured fins, and it pays to know what

you're looking for. Basically, you need the most efficient and well constructed fin you can afford. And while mulling over the wide discrepancies in price from one model to the next, remember to figure in the probable replacement cost of an ill-considered first choice.

Many good fins are constructed using more than one rubber compound. In order to produce a durable fin that evenly distributes stress, many manufacturers utilize different compounds to allow maximum suppleness of the blade while adding rigid reinforcement at stress points along the sides and around the foot pocket. Dacor takes a unique approach to this problem by laminating an extremely flexible stainless steel plate between layers of rubber in the blade. You'll pay a little more for this fin, but many divers have found the extra cost well worth the quality. Even less expensive fins should incorporate more than one compound for durability and efficiency.

What Size Blade?

Another feature to look for is the ratio of blade area to foot size. A stiffer blade should be smaller in proportion to fin size as it concentrates much more stress around the foot pocket. More flexible fins allow a larger blade area. Recent research indicates optimum efficiency is achieved with a longer and more flexible blade than swim fins have provided in the past. In general, these are easier to use, less fatiguing and can provide as much thrust as you feel comfortable with.

Muscle Power

Before you trade in your faded duck-feet for a slick set of power thrusters, though, remember your legs. They're accustomed to whatever type of fin you presently use. When you change fins, you'll probably be using different leg muscles which are not accustomed to the stress. Take it easy with any new set of fins. Practice in a pool or in shallow, protected water for a while before your next open water dive. Muscle cramps can ruin the best dive.

The choice is yours, and considering the size of today's market in swim fins, comparison shopping can be complex and time consuming. But the satisfactory sense of effortless propulsion that comes when you've finally found the right fin can be an exhilarating experience that makes all the hassle insignificant.

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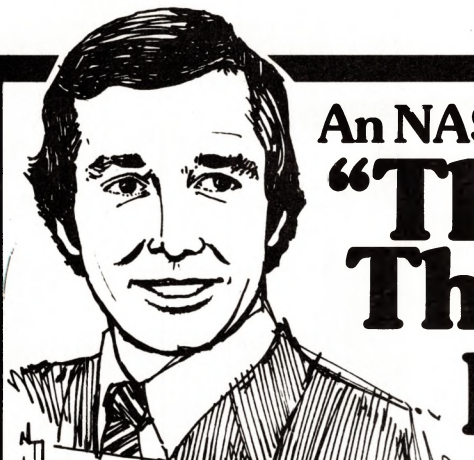
When you're feeling a little less adventurous, you can snorkel around with bright sergeant majors, angel fish, red snappers, groupers, lobsters, and tropical fish so tame they'll swim up to peek in your mask. You'll also see brain coral, giant purple sea fans, black coral and a kaleidoscope of brilliantly colored red and orange sponges.

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An NASDS Profile: Jeff Yordy

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Seven years ago Jeff Yordy was teaching math and science to Jr. High School students.

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For 10 weeks, Jeff Yordy dedicated himself to learning at the NASDS Instructional Diving College in San Diego. Upon completion, he moved to St. Petersburg, Fla. where a position had been arranged for him by the

College at the Tackle Shack. For two years he learned the diving business inside and out.

In 1976, he was offered a manager/partnership position at World of Water in Tampa. He accepted the challenge. One year, a full time staff of instructors and an NASDS

affiliation later, World of Water celebrated its best year

ever. Another year passed and another record set, this

time in a new facility that has

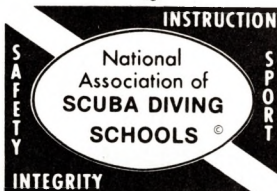
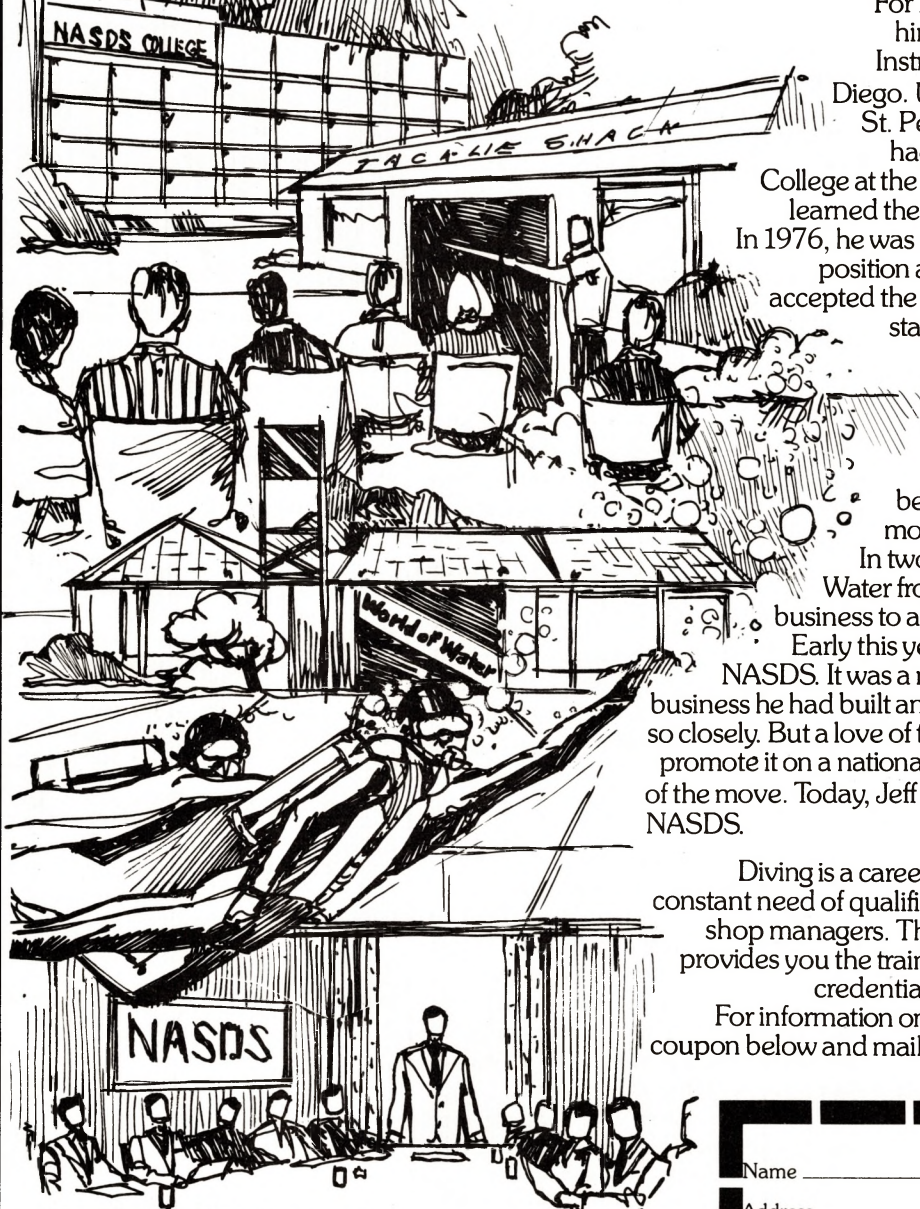
been heralded as one of the most modern and complete in the state.

In two years, Jeff had taken World of Water from an \$80,000 a year marginal business to a \$500,000 story-book success.

Early this year he was offered a position by NASDS. It was a most difficult decision to leave a business he had built and partners he had worked with so closely. But a love of the sport and an opportunity to promote it on a national level tipped the scales in favor of the move. Today, Jeff Yordy is Associate Director of NASDS.

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Ocean Thermal Energy: Fuel for the Future

Warm seawater is one fuel supply nobody can boycott.

BY RO SHEFFE

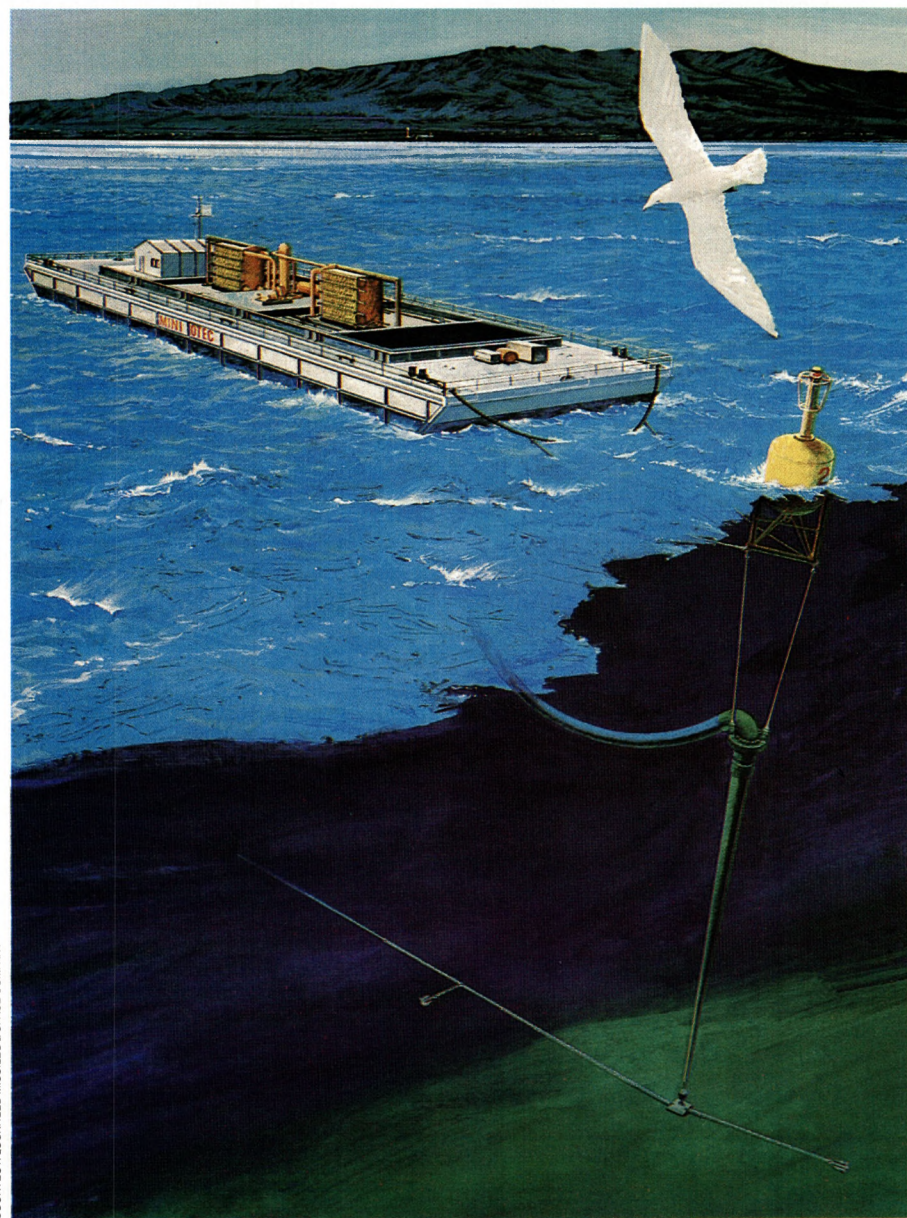
By the time you read this an oddly shaped barge floating a mile off Hawaii should be pumping electricity from the world's largest storage battery. The experimental plant runs on free fuel, produces no waste and was built from off-the-shelf components and an idea first proposed in 1881.

As an earlier age trusted to the gods of sun and water to provide sustenance, our more (or less) sophisticated society depends on an unending flow of electricity to turn the wheels of a technological age. But what happens when the god grows greedy, demanding an ever greater share of the wealth it helped to create? With the price of crude oil approaching \$15 per barrel, the search begins for a cheaper way to feed the monster. And at least part of the answer may be the forces that kept us well fed and happy long before there was an electrical cord or a socket to plug it into.

Solar power has long been studied as a potential alternative source of energy, but two problems persist. Efficient solar collectors are expensive, and power storage effectively impossible. Solar power production peaks at noon with the sun at its zenith, but peak consumption occurs after dark when millions of TVs, dishwashers, street lights and neon golden arches are switched on at once. So when the lights snap on in New York, where is the sunlight when it's most needed? That's right, it's 4000 miles away, heating the Pacific Ocean—the largest, cheapest, and most efficient solar collector on earth.

Ro Sheffe, associate editor of *Sport Diver*, covered commercial power production issues and private utilities regulation as legislative correspondent to the *Tennessee Democrat*.

continued



COURTESY, LOCKHEED MISSILES & SPACE COMPANY

Moored off Hawaii, a small prototype OTEC plant should be pumping its own electricity by mid-July. The plant's 2700-foot cold water pipe was assembled in Honolulu in May, towed in sections to a site off Ke'ahole Point, then flooded, dropped into place and moored half a mile below the surface.

The plant moored off Hawaii uses the ocean's surface as a vast heat sink which stores energy collected during the day to provide a 24-hour source of near-constant usable power. Known as OTEC-1, for ocean thermal energy conversion, the plant generates electricity by forcing vaporized liquid under pres-

sure past the blades of a turbine generator similar to those used in conventional oil and coal fired plants. But there the similarity ends.

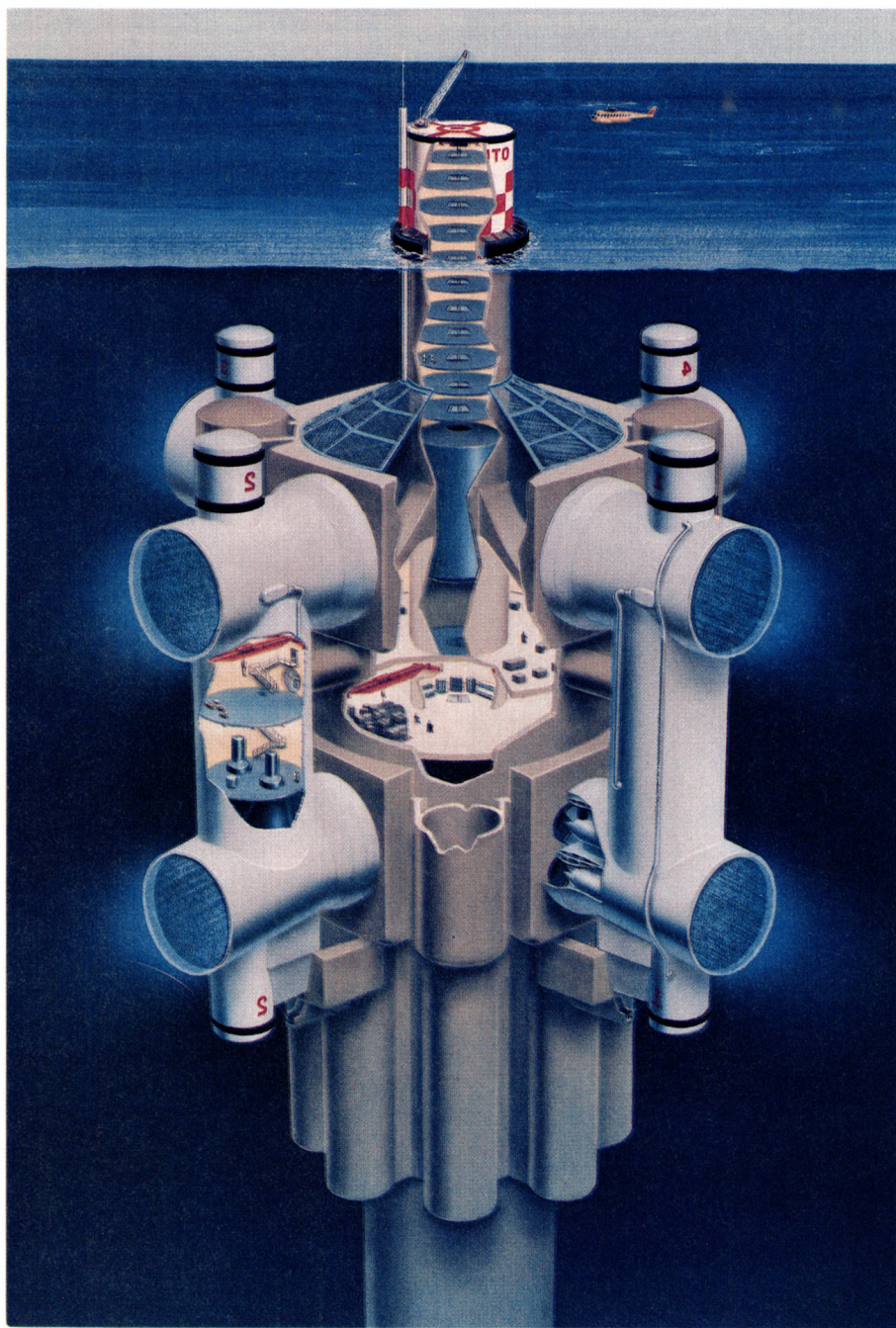
Since conventional plants use water as a working fluid, boiler temperatures of up to 1000°F must be maintained to flash the water into vapor. This becomes

an expensive procedure when fuel costs rise. But by using ammonia continuously recycled in a closed system, the need for high temperatures is eliminated. Surface temperatures in Hawaiian waters seldom dip below 75°F, far higher than necessary to boil ammonia. Passed through warm seawater, the liquid ammonia flashes into vapor, spins a turbine to produce electricity, then is re-condensed into liquid by water at 40°F, drawn from the depths through a half-mile-deep pipe. Plentiful, non-polluting and certainly cheap, warm seawater offers obvious advantages over other forms of fuel. The ammonia is continuously recycled, and the system's only output is clean electricity.

This amazingly simple concept was first suggested by Jacques d'Arsonval, a French physicist, in 1881. One of his students, Georges Claude, built a prototype plant from d'Arsonval's design in Matanzas Bay, Cuba 40 years later. But a Caribbean hurricane destroyed the plant less than two weeks after completion, exhausting Claude's capital resources and shelving the idea until an oil boycott in 1973 revived interest in alternative energy sources. A year later, the National Science Foundation solicited feasibility analyses from industry, and by 1978 the newly created Department of Energy had budgeted \$35 million in contracts to Lockheed Missiles and Space Co. and Dillingham Corporation to research a 50-kilowatt pilot plant.

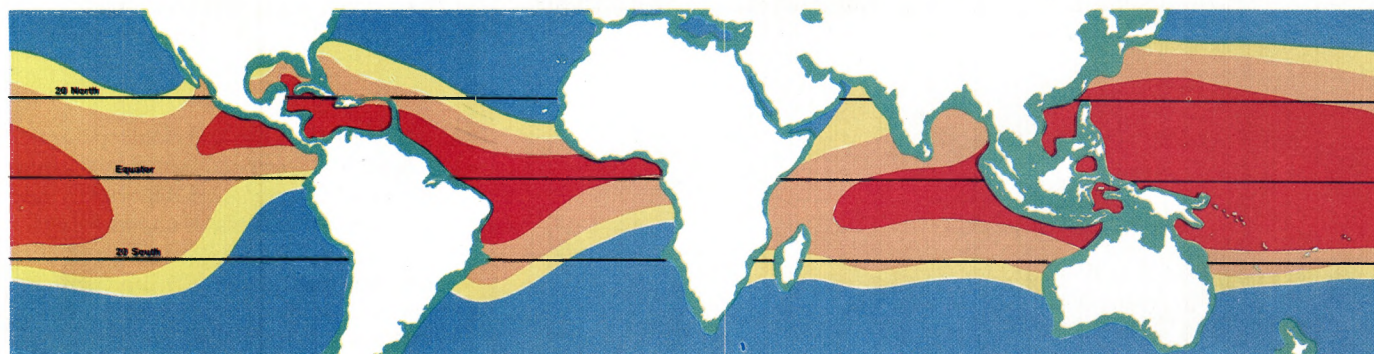
Built on a modified Navy barge anchored in 3000 feet of water 1½ miles off Ke'ahole Point, Hawaii, Lockheed's plant will produce only 15 kilowatts of surplus electricity, using 35 kilowatts to power its own electrical systems and test equipment. An M.I.T. physicist dryly estimates the pilot plant's output at about the same as that of a Volkswagen engine. But the OTEC concept draws its appeal from an economy of scale, and by 1985 at least one full-size, 200-megawatt plant is expected to be in operation, producing enough electricity to sustain a city of 200,000.

The larger plant will require a greatly modified design to minimize the effects of wind and wave action, and this may be accomplished with a spar buoy configuration, placing most of the 600-foot-tall plant underwater. Like an iceberg, only the tip of the plant will protrude above the surface, insulating the submerged portion from violent



COURTESY, LOCKHEED MISSILES & SPACE COMPANY

Like a monolithic iceberg, a commercial OTEC power plant thrusts only 60 feet above the surface. The rest of the plant's 300,000-ton bulk is submerged, insulating the heat exchangers and massive 3000-foot cold water pipe from wave motion and violent storms. A crew of 23 sleeps at surface level and works hundreds of feet below.



Regions suitable for OTEC operation fall roughly between 20 degrees north and south of the equator. OTEC requires depths of 3000 feet and a temperature gradient of at least 27°F between surface water and cold, deep water; but greater efficiency is obtained with a greater difference, and at sites such as Hawaii this differential can exceed 40°F.

storms commonly experienced in the latitudes where the plants will be located. Hundreds of feet below the surface, a crew of 23 will operate the plant on a 24-hour schedule.

The full-blown plant will necessarily be huge, about 600 feet in height not including the cold water conduit, by more than 300 feet in diameter. Four giant heat exchangers, the heart of the OTEC system, each reach the height of a ten-story building. Dropping into the depths below the plant, a 3000-foot-long cold water pipe may reach an incredible 300-foot diameter, drawing a sustained flow of water equal to that of the Missouri River at Omaha.

One reason for the immense size needed to make an OTEC plant economically viable is its surprisingly low efficiency. At an operating efficiency of about 2.5 per cent, the concept would at first glance seem absurd. But taking into account the amount of energy needed to mine, refine and transport conventional fuels to plant sites, OTEC looks better. Using a net energy assessment to measure the true cost of power production, conventional plants produce 1000 calories of output at an expenditure of more than 3000 pre-production calories. OTEC produces the same output at a net energy cost of only 700 calories.

In order to be economically competitive, full size OTEC plants must be sited in areas where the temperature difference between surface water and colder deep water exceeds 27°F. This restricts potential plant sites to latitudes

roughly within 20 degrees of the equator where depths exceed 3000 feet. Cold surface currents make the West Coast of the U.S. unsuitable for OTEC plants, but feasible locations include Florida, the Gulf of Mexico, Central America and wide expanses of Atlantic, Pacific and Indonesian waters.

Besides providing the electrical needs of coastal cities, one application of the "new" technology might be to power mobile, energy intensive industrial facilities. Floating untethered to "graze" in the open ocean, industrial OTEC plants are ideally suited for the manufacture of agricultural ammonia, drawing needed nitrogen from the air and hydrogen from seawater to combine them with self-produced electricity. The resulting ammonia, easily transported in liquid form at normal temperatures, could be used traditionally as fertilizer. But a more dramatic prospect is its potential as an economically viable means of transporting energy to areas greatly dependent on imported oil but unsuited for OTEC deployment, such as New England. There the ammonia could be cheaply decomposed into nitrogen and hydrogen, providing a highly efficient source of fuel for power generation and a welcome utility cost break for consumers.

Areas such as Jamaica and Indonesia, rich in bauxite but lacking a cheap source of the immense quantities of electricity to refine it into aluminum, would be ideal sites for the mobile OTEC plants. Both regions are environmentally conducive to OTEC operation.

Yet another application, feasible but not yet cost-effective, is a modified OTEC design which could produce electricity by desalinating seawater. This incredible system uses seawater itself as a working fluid, eliminating the need for an ammonia cycle. Considering the rapidly accumulating wealth of some of the more arid regions of the earth, it may not be long before even this design becomes cost-effective. And multi-billion-dollar OTECs for export probably

wouldn't hurt the U.S. balance of trade deficit, either. Petro-dollars for solar desalinators seems a fair enough trade.

Up to now, OTEC research has been paid for almost completely with federal tax dollars. The state of Hawaii, scrambling to offset a crushing 98 per cent dependence on imported fuels, chipped in funds for the pilot plant's 2700-foot cold water pipe.

But the brunt of the plant research costs, and the millions that preceded it, came from the Energy Research and Development Agency (ERDA), one of two new agencies to arise from the ashes of the late Atomic Energy Commission when glaring conflicts of purpose necessitated a bureaucratic trust bust. OTEC's \$35 million budget is pocket change to an agency that annually pours hundreds of millions into breeder nuclear reactor research, but even this level of funding indicates significant political support by key congressional budgeteers.

At present the OTEC program calls for continued federal funding long enough to carry the program through its infancy into a mature, cost-effective stage, from which point it would be expected to support itself with private capital in a competitive marketplace.

This could occur as early as 1985 if all goes well this summer in Hawaii. If OTEC-1 performs as expected, subsequent plans call for a stepped approach to full power production, culminating in a government built commercially competitive plant anticipated on-line before 1986. At a staggering two to five billion dollars each, the first plant price tags might be a bit hard for private investors to swallow. But technological refinements and federally sponsored incentives, such as tax breaks, loan guarantees and government cost sharing should bring OTEC investment risks within feasible limits relatively soon. Hints one Lockheed official, "There is considerable scope for imaginative funding proposals."

The pilot plant will be studied

continued



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closely to identify and solve potential technical and environmental problems. At present, these seem remarkably few for an untried industrial endeavor.

Heat exchangers, the evaporators and condensers that will boil and re-cool the ammonia, may experience drops in efficiency due to marine biofouling, and at least one suggested remedy would have a direct impact on the area's biota. Since ammonia easily corrodes copper, a material conventionally used to reduce fouling in marine pipe, biocides may have to be used to prevent plankton growth. A preferable, but more expensive, solution is a system of mechanical scrubbers. Engineers estimate a once-a-week passthrough of nylon brushes or other abrasive substances would keep the piping system clean and efficient.

The environmental effect of full scale plants skimming off warm surface water and replacing it with a continuous upwelling of chilled deep water remains to be seen. Blooms of photoplankton may be one result, serving as the first link in a food chain which would have an uncertain impact on the local ecosystem.

The greenhouse effect of carbon dioxide buildup in the atmosphere is tempered somewhat by the oceans which act as a sponge to absorb excess CO₂. Large scale OTEC deployment might impede or enhance this absorption—but so far no one knows which.

Small leaks of OTEC's working fluid, ammonia, would be soluble and harmless in seawater, up to a point. The remote but significant possibility of a total loss of tons of ammonia must be considered, and the result weighed against the magnitude of its effect rather than the probability of its occurrence.

But as an alternative to fast rising costs of fuel consumptive plants and the ever more obvious risks of nuclear power production, OTEC deserves at least a fair hearing in the court of opinion. The technology, construction methods and engineering prowess needed to assemble competitive OTEC facilities are available today. All that remains is for a cost-benefit oriented industry to be shown the economic advantages of an ecologically benign energy system.

Perhaps that will be accomplished this summer in Hawaii. It's a pity Jacques d'Arsonval can't be aboard for the ribbon cutting.

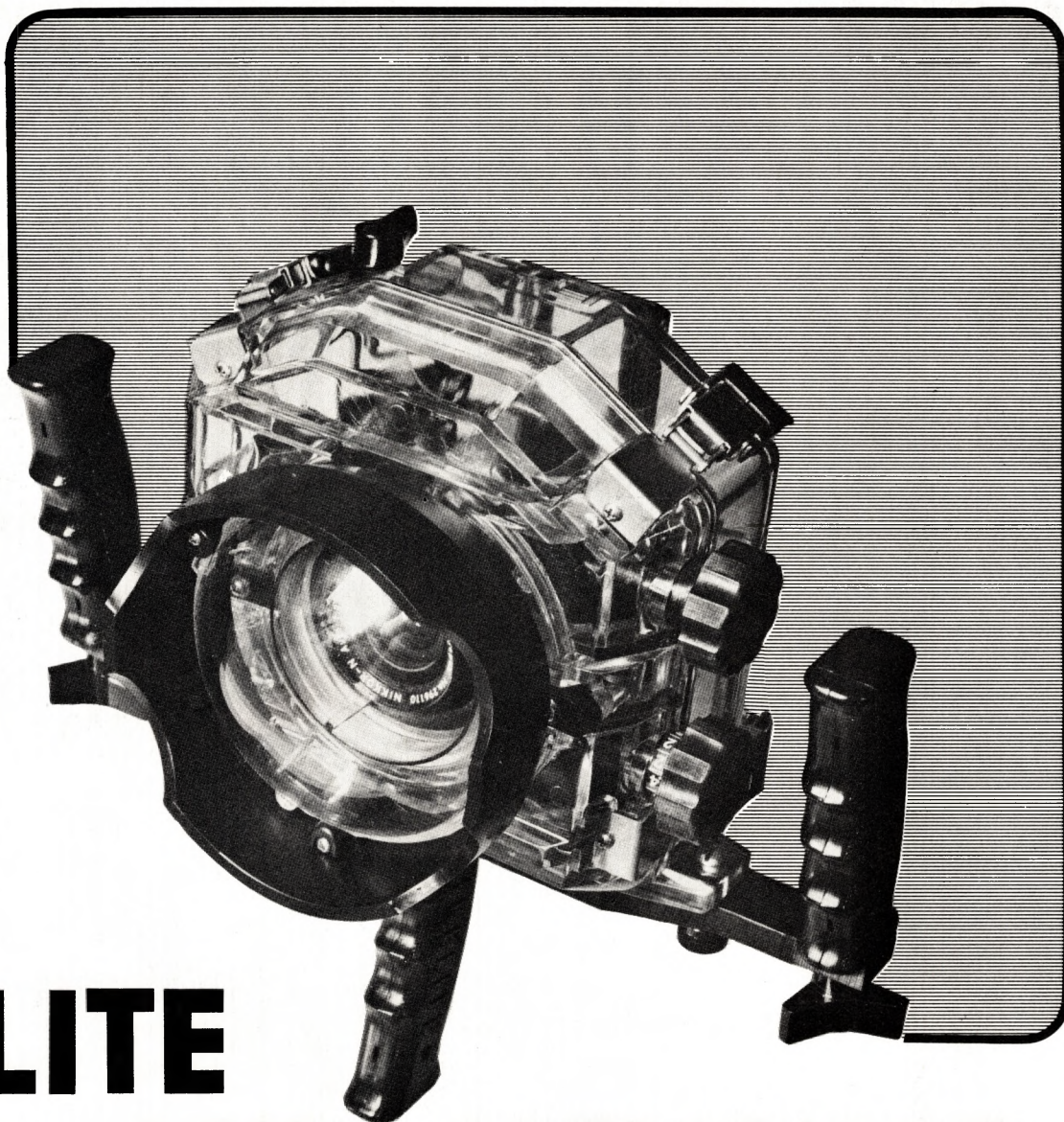
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*Aruba is cafe days and casino nights,
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BY PHIL TRUPP

RICHARD STEWART



RICHARD STEWART



Top: This wharfside market in Oranjestad, Aruba, can accommodate most of your basket, vase and urn needs. Above: Not all of Aruba's legendary visibility lies underwater.

Anton Segers, the youthful, red bearded director of Aruba's Sub-sea Safaris, quietly gives last minute instructions to divers.

Behind him a rusty stalk of mast breaks water; a big crossbar slants across the swells. There's a wreck down there, a big one. From the surface it looks spooky—and incongruous. After all, Aruba is *la dolce vita*; it's for swinging, not swimming. If the western shoreline is clearly visible, the island's busy hotels,

casinos and beautiful people with passports seem far away indeed.

Segers and an assistant lead the divers 60 feet down a descent line. Suddenly the remains of the World War II freighter *Antilla* snap into focus. Scuttled at the outbreak of war, the German ship is broken in two. She issues thin trails of oil and some of her compartments are

Phil Trupp is Sport Diver's Washington correspondent.

continued

Right: The wreck of the German freighter Antilia lies in 55 feet of water 20 minutes off Aruba.

unopened. Strangely, *Antilla* feels as if she is still alive.

The wreck is an eye-opener to the underwater possibilities of this island which, until now, didn't advertise as a diving location. But Aruba's time has finally come.

The upsurge in scuba is no accident. As divers extend their outreach, their growing presence is very much a fact of economic life in the Caribbean. Aruba intends to capitalize on it.

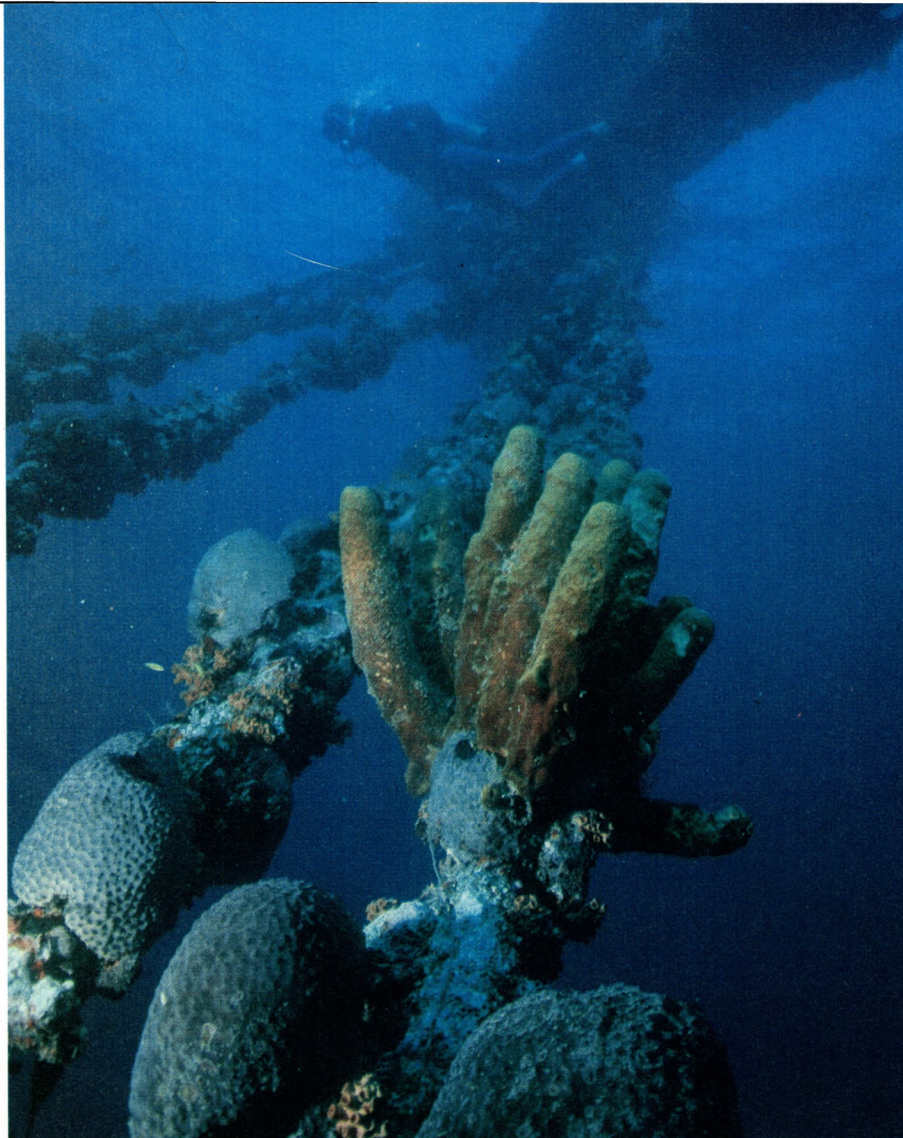
"The best-kept secret in the Caribbean is that Aruba is a dive site—and more," says Harold M. Malmberg, president of the island's biggest tour service agency, De Palm Tours.

Malmberg says the island is perfect for people who don't want to dive all the time, or for those ubiquitous couples of which only one happens to be a diver. Like a thoughtful hostess, Aruba offers underwater life for one, night life for the other.

Malmberg and Segers are pushing hard on the dive Aruba theme. Because Subsea is already established it has a jump on the market and is planning to broaden its scope.

Operating out of the Aruba Sheraton on the west side, Subsea has been growing almost geometrically since Seger took over three years ago. In its first year about 2000 divers passed through—mostly novices and first-timers on a resort course. This year Seger is projecting 6500 or more.

Subsea has a full staff of guides and instructors, plenty of scuba bottles in the rack, a hefty compressor and two dive boats including the tug. It serves the major hotels and accommodates about 20 divers a day. The number will increase, Seger says, with the purchase of a 60-foot boat capable of cruising the sister islands of Bonaire and Curacao.



RICHARD STEWART

Subsea's basic underwater fare is the *Antilla* and the wreck of the *Peder-nales* in 20 feet of water. There are shallow patch reefs along the south coast and a deep wall for experienced divers. Inshore visibility is fairly limited, but on the wall visibility of 100-130 feet is not considered uncommon.

Once the only dive shop in town, Subsea will soon have a competitor, Surfside Watersports.

Located at the 64-room Talk of the Town Hotel near the capital of Oranjestad, Surfside was preparing to launch its scuba operation at the time of our visit in April. Talk of the Town owner Ike Cohn is optimistic.

"More and more we are being asked about scuba," Cohn told us. "It makes sense to give people what they want."

Surfside, in addition to scuba, will offer water skiing, sailing, snorkeling and resort courses. Its package will grow with demand.

The operation's basic plan calls for two-tank day excursions plus night diving for about 25 divers. Surfside's man-

ager, Dutch charter skipper Henry von Loon, will concentrate on the more colorful southern reefs and the wall. He is not much interested in the west side wrecks where the water is turbid and the coral is sketchy at best.

Von Loon wants an "elegant" dive package and will make the most of the rather opulent facilities offered by Talk of the Town. There is a disco and several fine restaurants, including the late night Moonlight Grill which stays open until two in the morning.

Wisely, Surfside and Subsea have decided to share the wealth of Bonaire's international reputation for diving. Subsea is now working with Peter Hughes' Dive Bonaire and the Flamingo Hotel. Groups of five are flown in for short stays at a nominal cost.

Surfside and Subsea have plans for double island tours: for instance, four days in Aruba and three at the more sedate and diverly Bonaire. The island is less than an hour away by air.

For those who do not live by scuba alone Aruba may be the answer.

SPORT DIVER DESTINATION DATA

ARUBA

GENERAL

Location: 15 miles north of Venezuela and 42 miles west of Curacao
Size: 70 square miles
Topography: flat, hilly island with sloping beaches, rocky coastline, seaside cliffs
Climate: tropical with 20 inches of precipitation annually
Population: 63,000
Largest towns: capital Oranjestad (pop. 20,000), San Nicholas
Languages: Papiamentu, Dutch, English, Spanish
Ethnic composition: Indian/white 80%; black 20%
Economy: 30% industrial, 70% tourism
Monetary unit: N.A. Florin = \$0.57
Diving season: year-round
Tourist season: Dec.-April

DIVING

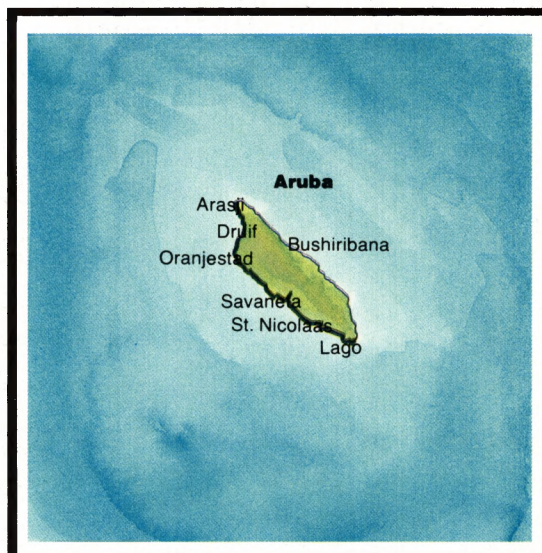
Water temperature: 78-79° F year-round
Visibility: 50-60 feet
Depth of dives: 10-100 feet
Currents: 0-1/2 knots
Tidal fall: 1 foot
Types of diving: reef, wreck, night
Skill level: novice, intermediate, advanced
Dives per day: 3
Diving craft: good
Sights:
Fish: grouper, angel, snapper, all typical tropical
Coral: elkhorn to drop-off, general reefs
Sponges: more than ten varieties
Other: all Caribbean species of marine life
Restrictions: none

DIVING SERVICES

Instruction available: resort course, open-water certification
Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, BC with inflator, depth gauge, partial wet suit, dive light
Equipment sales: mask, fins, snorkel, regulator, safety vest, BC, BC with inflator, knife, game bag, dive light
Equipment repair: excellent
Camera repair: none
Air: to 3500 psi
Guides: excellent

DIVERSIONS

Ground transportation: bus, taxi, rental car, motorbike, bicycle
Shopping: good and reasonable
Restaurants: excellent and reasonable
Nightlife: excellent
Other sports: tennis, fishing, sailing, water-skiing, deep sea fishing



NETHERLAND ANTILLES

Don't Miss: natural bridge rock formation of Oyo, gold mill ruins at Balashi and Bushiribana, casinos in hotels, De Olde Molen

JUST IN CASE...

Hospitals: Horacio Oduber Hospital, L.G. Smith Blvd., Oranjestad, ph: 4300
Diving doctors: none
Recompression facilities: nearest in Curacao, ph: 24900
Police: ph: 4555 or 4000
Marine rescue: UHF 156.80 MHz Channel 16; UHF 156.55 Channel 11
American Express: Maduro & Sons, Inc., 106 L.G. Smith Blvd., Oranjestad, ph: 3888
U.S. Consulate: American Embassy, J.B. Gorsiraweg 1, Curacao, ph: 13066

PLANNING

Diving tours: Subsea Safaris at Sheraton Hotel, Palm Beach; De Palma Tours, L.G. Smith Blvd. 142, Oranjestad, ph: 4400
Land tours: De Palma, Brunds, Stadionweg 7, Oranjestad
On your own: Airlines—American Airlines (New York-Aruba) 1-800-433-7300; A.L.M. Airlines (Miami-Aruba) (305) 526-6445; KLM Royal Dutch Airlines (New York-Aruba, Miami-Aruba)
Airports: Aruba International Airport, Princess Beatrix Airport, Oranjestad, Aruba
Cruise Lines: Costa Lines, ph: 1-800-327-5704; Holland American Lines, ph: 1-800-223-0660; Norwegian America Line, ph: 1-213-422-3905; Princess Cruises, ph: 1-213-553-7000; Royal Caribbean Cruise Lines, ph: 1-800-327-6700; Sitmar Cruises, ph: 1-800-421-0880
Marinas: Aruba Nautical Club; Bucuti Yacht Club
Accommodations: Aruba Concord Hotel, ph: 800-223-7944; Aruba Sheraton Hotel, ph: 212-949-1010; Caribbean Hotel, ph: 212-986-3302; Americana, ph: 800-228-3278; Holiday Inn Aruba & Kings International Casino, ph: 800-238-5510; Basi Ruti Beach Hotel, ph: 2222; Manchebo Beach Hotel, ph: 212-628-3319; Aruba Beach Club, ph: 212-757-5910; Divi Divi Beach Hotel, ph: 800-847-7198; Tamarijn Beach Hotel, ph: 800-847-7198; Talk of the Town, ph: 212-628-3319; Hotel Caribana, ph: 1687; Central Hotel, ph: 2260; Victoria Hotel, ph: 3850; Astoria Hotel, ph: 5132
Campgrounds: none
Customs and Immigration: requirements—passport, proof of citizenship
Import restrictions: none
How much cash may you bring into the country? no limit
Export restrictions: none
How much native currency may you take out of the country? no limit
U.S. Customs re-entry restrictions: \$300 worth of goods duty-free.

Bonaire

*Two forceful men and abundant coral
add up to a Caribbean legend.*



*Above: A climb up stone steps
hewn in a hillside above Kara-
pata, Bonaire, yields one of the
best vistas on the island. Right:
A Bonaire sunset over the
Habitat pier.*



My friend Shirley goes flying off to Bonaire every chance she gets. Must be an *amour*, I thought. But having now visited the island for myself, I suspect her *amour* is Bonaire.

Shirley isn't alone in her passion for this 19-mile-long Dutch island in the Netherland Antilles. Over the years diving journalists have filed copy enough to fill a small library, and more than a few of their articles might have been written by Shirley herself. They use her kind of adjectives—"fabulous," "enchanted," "spellbinding."

This is only natural. Bonaire invites passionate feelings and purple prose. You may travel far and wide, but in the end Bonaire must rank among the very best in the Caribbean—maybe in the entire diving world.

For divers this sedate little spit of land with its stubby hills and funny flamingos has all the ingredients of excellence. Its reefs are healthy and vibrant. Water clarity is extraordinary, and colors take on a hard, clean edge. Marine life is abundant. One of the rules says divers are to feed the fish every chance they get; this makes for a very congenial underwater relationship.

Dive sites seem endless—not merely a theme and variations. Bonaire's strong suit is variety. There are walls and the intriguing double reefs at "Angel City," and of course the fabled mystery wreck.

I can't imagine a place where dive sites are more conveniently located. If you don't make the morning flattop there are hundreds of superior sites less than 50 yards off the beach. Grab a tank, your buddy and a box lunch, and you're blissfully on your own.

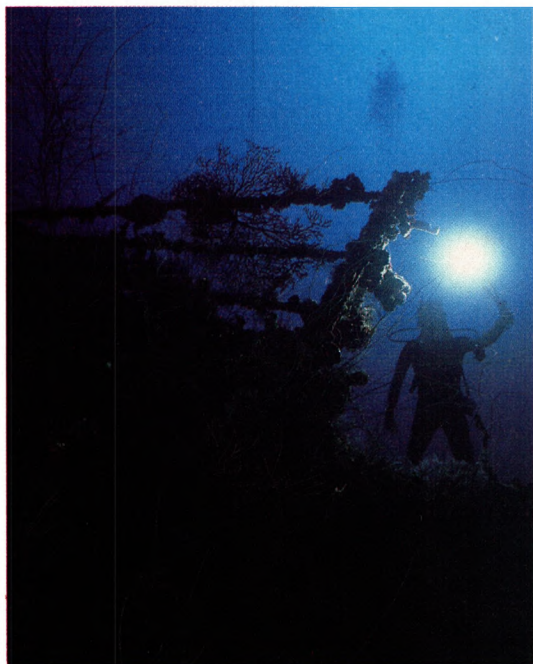
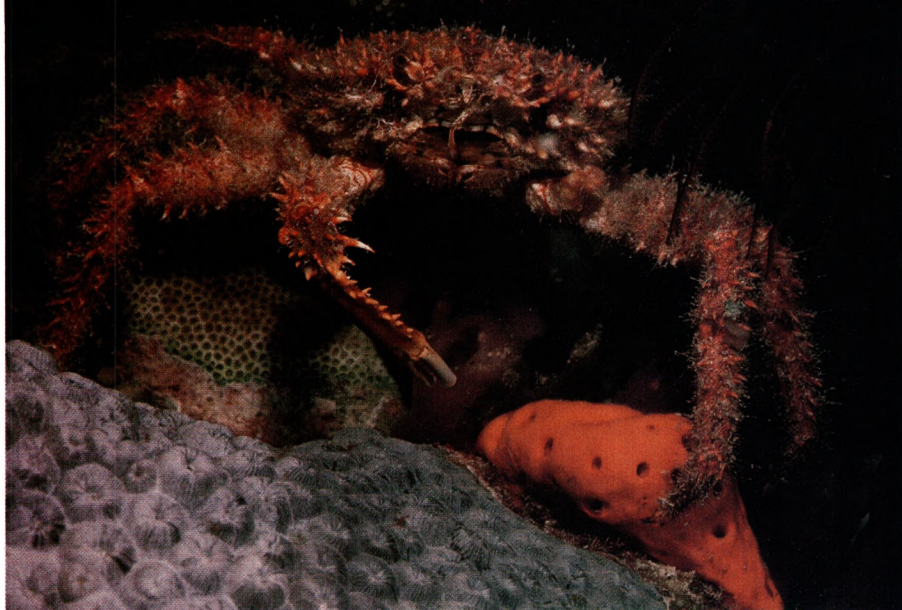
The island's three dive operations are outstanding. Whatever you may need, they've got it—in triplicate. Everywhere the goal is to provide hassle-free diving. And the goal has certainly been achieved.

Equally important, I believe, Bonaire puts you in touch with remarkable and even inspiring people. After all, most islands tend to mirror the people who make it go, and Bonaire is no exception. Its success owes much to the vision of two forcefully creative men, Peter Hughes of Dive Bonaire, and the near-legendary Captain Don Stewart of the Aquaventure Habitat.

If these two men run separate

RICK FRIESE

DAVID DOUBILET



Above: One example of the flamboyant marine life teeming in Bonaire's shallows. Left: Bonaire's famous mystery wreck near the double reefs of Angel City.

shops, they aren't competitors in the hard sense of the word. They are compatriots who share a vision of Bonaire as a special island. Each provides a unique style of tender loving care.

Peter Hughes, 31, is the new kid on the block. He and his wife Alice own and manage Dive Bonaire, located at the Flamingo Beach Hotel.

If there is such a thing as a winner in this crazy business of diving, Peter is it. This year Dive Bonaire may serve 2000 touring divers, most of them quite finicky. I doubt they will find cause to complain.

Captain Don is certainly one of the most fascinating men in the Caribbean, but Peter has shaped his own charisma with a touch of class. He is young but with a worldliness that tells you he's been around. Wall Street could use his

common sense and business acumen; Hollywood would cash in on his striking good looks.

A gutsy and imaginative entrepreneur with more than 20 years of diving experience, Peter took over a bankrupt Teach/Tour three years ago and created a model operation. Dive Bonaire is a big, modern facility more fully equipped than many U.S. dive stores. It is probably the most efficient air station in the islands, capable of pumping 100 aluminum 80s per hour.

Peter may be the original easy diver. You simply walk in, gear-up and exit onto a waiting flattop, of which there are three. In minutes you're in the water. What more could you want?

"You can always improve," Peter says.

If the physical plant is running at

top efficiency, he will make it his business to scout new dive sites. Peter is always making it better, smoother, more personal.

"That's why he gets so much repeat business," one of the divers told us.

Bonaire has a rare quality of newness. It's a very personal quality and Peter transmits the feeling to his guests.

"I want them to enjoy it as much as I do," he says.

From what we gather, they do.

A word about the Flamingo Hotel: its flavor is that of a self-contained Spanish-styled village with its own outdoor cafe, bar and gift shop. Rooms are spacious and bright. My balcony overlooked the harbor and I could see big stands of elkhorn in the clear water. Assistant manager Scott Wiggins, 21, is meticulous about service. He's a friend from the moment you arrive. And blessed be the hotelier who knows the need of a snack late at night, especially in the islands. Scott and Peter know how to please in ways that really count.

Captain Don Stewart is a writer's dream, a 20th Century Renaissance man—a poet, novelist, film maker, businessman, banjo strummer, jazzophile, gambler, dreamer and reputed clairvoyant, an amazing Man-fish who once gauged depths by the changing color of his red scarf. Few men wear a golden earring with *panache*, but Captain Don would make the French proud.

He and his very personal, intimate domain, Aquaventure Habitat, are synonymous with Bonaire. He came to the island 17 years ago in his sailing ship, *Valerie Queen*, dropped anchor in Kralendijk harbor and never left. In his log, dated May 21, 1962, he wrote: "... Looks like a fantastic water island." Thus the first "Bonaire Bug" was born. Thousands were to follow.

Captain Don was—and still is—a powerful influence in the shaping of Bonaire. He charted much of the underwater terrain, invented ingenious ways to get divers in and out of the water, and diving with the maestro has more than a few rewards. No creature in the sea is more compelling than Captain Don in scuba. And if he is amusing, cajoling, opinionated and even sometimes testy, he is past, present and future incarnate. He is his own trip—and well worth the ticket. If you should ever doubt his talent for the unusual,

continued

Right: Sunlight slants through the planks of the Habitat pier on Bonaire.

he will remind you that his is the only cafe in the Caribbean serving chop sticks with meals.

Captain Don is, above all else, a civilized man who uses his slightly piratical appearance as a good artist might use color. He is adventurous and open-minded in important ways. He encourages his guests to view the Habitat as a launching pad for whatever projects or fantasies are do-able. He will dream along with you and add his own personal touch.

His dive operation is all business. The Habitat offers boats and tanks and everything else a diver needs, including modest bungalows and "monk's cells" for \$10 a night—including your very own hammock. If the accommodations aren't exactly the Ritz, there is Captain Don's good table talk, the most comfortable bar on the island and a very listenable set of rock/disco tapes. No frills doesn't mean no amenities, after all.

If you wish to dive with Captain Don but fancy a bit more luxury, you may stay at the Hotel Bonaire. The hotel, which he services, has an up-to-date dive operation. Now being expanded, it offers spacious rooms done in quiet woodhues, nice shops, restaurants and a casino. Manager Hank Priem believes in providing small luxuries. I'll never know how he came up with piping hot coffee in the afternoons when Bonaire's electrical generators are shut down. Such is the Dutch continental touch.

But Captain Don keeps his pale eye on the sea, and on Bonaire in particular. If his celebrity is occasionally taxing ("I wish folks would realize I have a private life, too.") he doesn't ebb for long. He is a catalyst destined to keep the pot boiling.

Bonaire does require the attention of Captain Don and Peter Hughes. The Caribbean is by no means static, and even in the sunny land of *manana* change is an important fact of economic life.

At the time of our visit Bonaire's island government had circulated a highly confidential report on the island's future. We learned Bonaire has opted for controlled growth. Progress, yes. Boom, not a chance.

The Caribbean's Council on Underwater Resources and Oceans (CURO), of which Stewart and Hughes are lead-

ing spokesmen, has made its ecology oriented position clear. The waters and reefs of Bonaire are the key to continued prosperity and good times. Any action contrary to this proposition is the equal of moral and economic suicide.

Peter, once divemaster at the soon-to-boom Anthony's Key Resort, Roatan, talks about booms that have become liv-

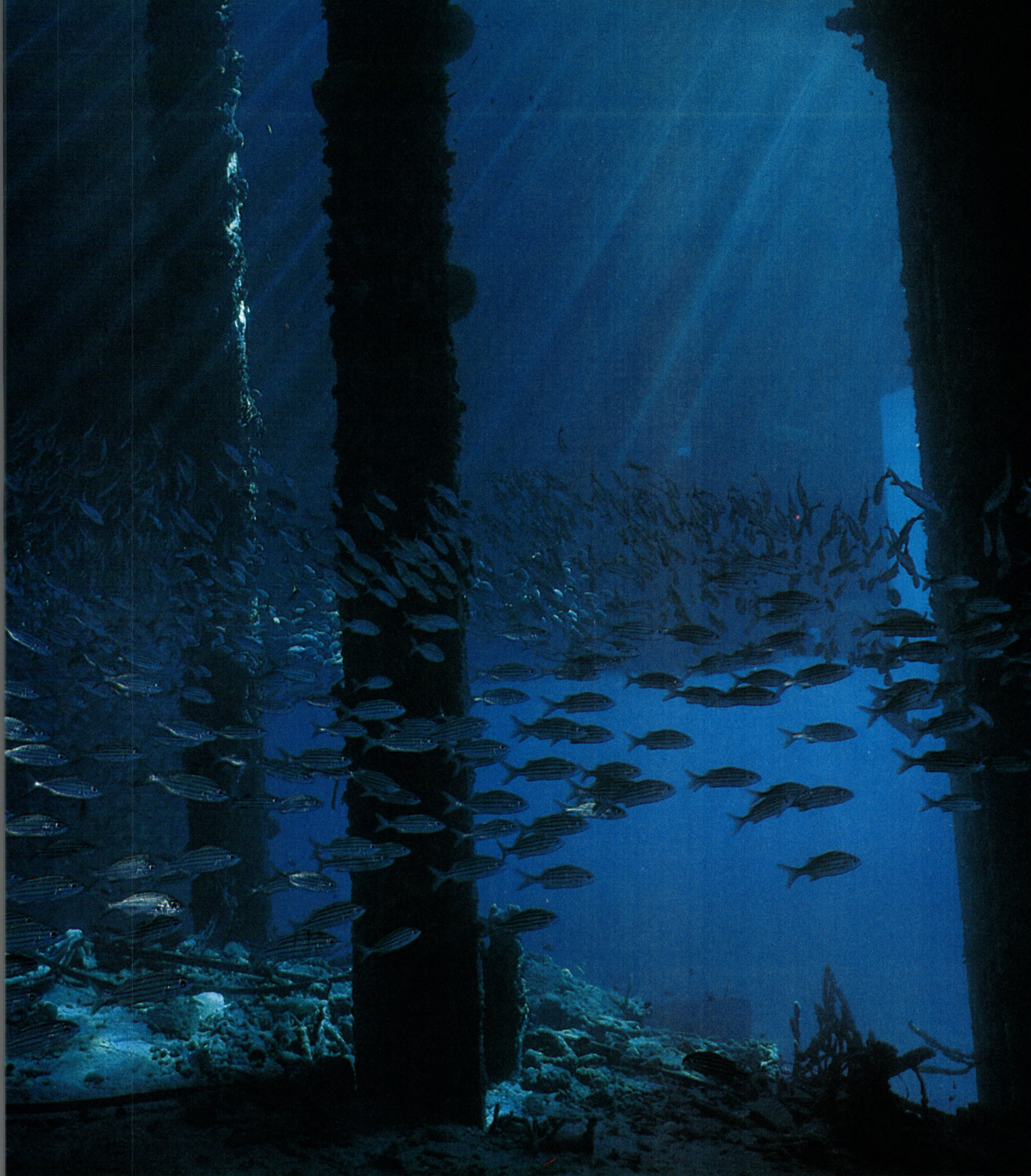
ing nightmares.

"I've seen reefs that look like they've been trampled by Wellington boots," he says. "Well, it won't happen here—not if Don and I have any say in the matter."

Captain Don, whose relationship to the island is very close to father and son, has real fears of a sudden push, an infusion of big money and power.



DAVID DOUBILET



He was pleased, if not altogether pacified, by the government's go slow report. Captain Don may be a romantic, but he is a realist in equal measure.

"What might happen here is unthinkable," he told us. "But the unthinkable can happen. That's why we can't let up. There's too much at stake."

Captain Don and Peter Hughes are

spokesmen for generations of divers who subscribe to CURO's conservation ethic and view Bonaire as its universal symbol. It is quite a large constituency, an even larger responsibility.

One day toward the end of our visit we stood with Peter above the sea at the Karpata plantation. We had surfaced moments ago from one of Bonaire's

magical dives. Peter understood that Karpata, that elemental microcosm of the sea, had gotten to us. We were hooked at last.

Bonaire teaches many lessons about the ocean and our relationship to it. Mostly, it teaches us about ourselves. I smiled. Shirley was right. In Bonaire you will find an *amour*.

continued

SPORT DIVER DESTINATION DATA

BONAIRE

GENERAL

Location: 50 miles north of Venezuela and 30 miles east of Curacao
Size: 112 square miles
Topography: a flat, hilly desert island
Climate: tropical with 22 inches of precipitation annually
Population: 9000
Largest towns: capital Kralendijk (pop. 2500)
Languages: Papiamentu, Dutch, English, Spanish
Economy: 70% industrial, 30% tourism; major exports—oil, salt, textile
Monetary unit: N.A. Florin = \$0.57
Diving season: year-round
Tourist season: mid-Dec. –mid-April

DIVING

Water temperature: 80° F year round
Visibility: 100-110 feet
Depth of dives: 50-130 feet
Currents: 0-½ knots
Tidal fall: 18 inches
Types of diving: reef, wreck, wall, night, cave, beach
Skill level: novice, intermediate, advanced
Dives per day: 4
Diving craft: excellent
Sights:

Fish: queen angel, fairy basslet, rock hind, blue chromi, variety of tropicals
Coral: coral bowl, green, black, elkhorn, gorgonia, staghorn, star, brain, pillar
Sponges: blue vase, tube, basket, orange, vase
Shells: cowrie, flamingo tongue, volute
Invertebrate: eel, ray, lobster

Restrictions: no spearfishing; illegal to remove any marine life

DIVING SERVICES

Instruction available: resort course, open-water certification
Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, pressure gauge, depth gauge, partial wet suit, dive light, Nikonos, underwater strobe
Equipment sales: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge, depth gauge, compass, partial wet suit, knife, game bag, dive light
Equipment repair: good



NETHERLAND ANTILLES

Camera repair: good
Air: to 3500 psi
Guides: excellent

DIVERSIONS

Ground transportation: bus, taxi, rental car, bicycle
Shopping: fair and reasonable
Restaurants: good and reasonable, average meal \$9-11
Nightlife: good
Other sports: tennis, waterskiing, sailing, fishing, bodysurfing
Don't Miss: Karpata, Angel City, Washington National Park, casinos, Flamingo Sanctuary

JUST IN CASE...

Hospitals: St. Francis Hospital, Kralendijk, ph: 8900 or 8445
Diving doctors: Dr. Henk Welvaart, ph: 8316; St. Elizabeth Hospital, Curacao, ph: 24900
Recompression facilities: St. Elizabeth Hospital, Curacao, ph: 24900
Police: ph: 8000
Marine Rescue: ph: 8151; UHF 16
American Express: no local representative
U.S. Consulate: American Embassy, J.B. Gorsinaweg 1, Curacao, ph: 13066

PLANNING

Diving tours: Dive Bonaire at Flamingo Beach Hotel, Peter Hughes, ph: 8285; Aquaventure at Hotel Bonaire, Don Stewart, ph: 8290; Atlantis Safaris, P.O. Box 530303, Miami Shores, FL 33153, ph: (305) 754-7480
Land tours: Bonaire Trading Co., ph: 8300, ext. 25
On your own: Airlines—ALM from Miami, ph: (305) 526-6445; American Airlines from New York, ph: 1-800-433-7300
Airports: Flamingo Airport, Bonaire, N.A.
Cruise Lines: Holland America Cruise Lines, ph: 1-800-223-0660
Marinas: Bonaire Yacht Club, Hotel Bonaire
Accommodations: Flamingo Beach Hotel, Hotel Bonaire, Habitat Hotel, Hotel Rochaline, all in Kralendijk
Campgrounds: none
Customs and Immigration: requirements—proof of citizenship/return ticket
Import restrictions: no animals
How much cash may you bring into the country? no limit
Export restrictions: none
How much native currency may you take out of the country? no limit
U.S. Customs re-entry restrictions: \$300 worth of goods duty-free

Where a notation "fair," "good," or "excellent" appears after an item, such as guides or diving craft, it refers to the *availability* not the quality of the services.



BOB WALLACE



RICHARD STEWART

Top: A floating fruit market on the Willemstad waterfront, Curacao. Above: Curacao's capital viewed from Willemstad Harbor.

It is hard to write about Curacao without some misgivings. It is a lively, sophisticated island with *joie de vivre* as its basic theme. More an international mecca than a lazy getaway, you must remind yourself in the colorful streets of Willemstad that, yes, this is the Caribbean. European elegance dominates. You may be a bit out of it if you've forgotten a jacket for the casino and most women will feel more at home in a Dior. But in Curacao there is always music and art and fun, and you don't really mind putting on a good face or brushing up on your languages. But what disturbs a visitor are the wounds

Curacao

A slick jet-set spa looks for a future underwater.

inflicted by this industrialized society on its precious waters.

We had snorkeled off the south beach in front of the Curacao Hilton to an aging string of shark nets. On the other side the walls of the island plunged straight down. The drop-off was totally unlike any I'd seen before—a snow white cliff, featureless and desolate. For hundreds of feet in all directions there was no coral, no fish, no hint of life.

Ben van Dalen, manager and director of Piscadera Watersports at the Hilton, provided us with air and a glass bottom boat for our dive in Piscadera Bay, a site close to shore where the likes of Lloyd Bridges and the Cousteaus once had their pictures snapped. The boat was handy, allowing us to get a good look before diving—if only there was something to look at!

The wall began at 30 feet or so and plunged abruptly downward through water as clear as I've ever seen. Sunlight glared harshly on its snowy mantle. Suddenly it was obvious that we were gliding over the chalky remains of a once-living coral reef. What isolated growth remained only hinted at the past. We were told that at one time these walls rivaled Bonaire. Now the identity had been lost. Whatever we touched crumbled, filling the water with powdery specks. Tube worms smothered their decaying hosts. I have never really feared an underwater avalanche, but here, in Curacao, the entire reef structure seemed on the verge of collapse. Long ago, as a child, I witnessed the mutilation of a huge hawksbill turtle as it lay dying on a crowded beach; what I saw that day at Piscadera Bay was no less disheartening.

Officially Curacao acknowledges its underwater tragedy. Inately, it blames

continued

spearfishermen and coral collectors. "...We hope that when you return... you'll find that life in our coral reefs is on the upswing," says the tour sheet.

Yes, in a century perhaps.

Ben van Dalen, who's been diving the island for more than two decades, calls the destruction "terrible."

"The oil refineries, they did it," he says. "They put acid in the water."

Gasoline is 40 cents a gallon in Curacao. It seems a paltry compensation.

Van Dalen says the destruction isn't island-wide, and that the impacted reefs have begun their regeneration. That's encouraging, but I'm afraid the repairs won't be completed in my lifetime.

Good reefs and wrecks exist farther offshore, sites sufficiently diveable, van Dalen says, to launch a "Caribbean Holidays" dive package.

He told us the reefs at Klein Curacao, 16 miles away, are as lovely as any in the Caribbean. We have no cause to doubt him. Klein Curacao is a long way from the refinery—an impossible boat ride in bad weather.

Van Dalen is also putting together a double island tour with three days at Bonaire and four at Curacao. That makes sense, for the average depths around Curacao are measured in hundreds of fathoms. Many reefs are clearly too deep for comfort. But van Dalen is perfectly sincere. If he says there are comfortable sites he can prove it by showing you he handled 1500 divers last year.

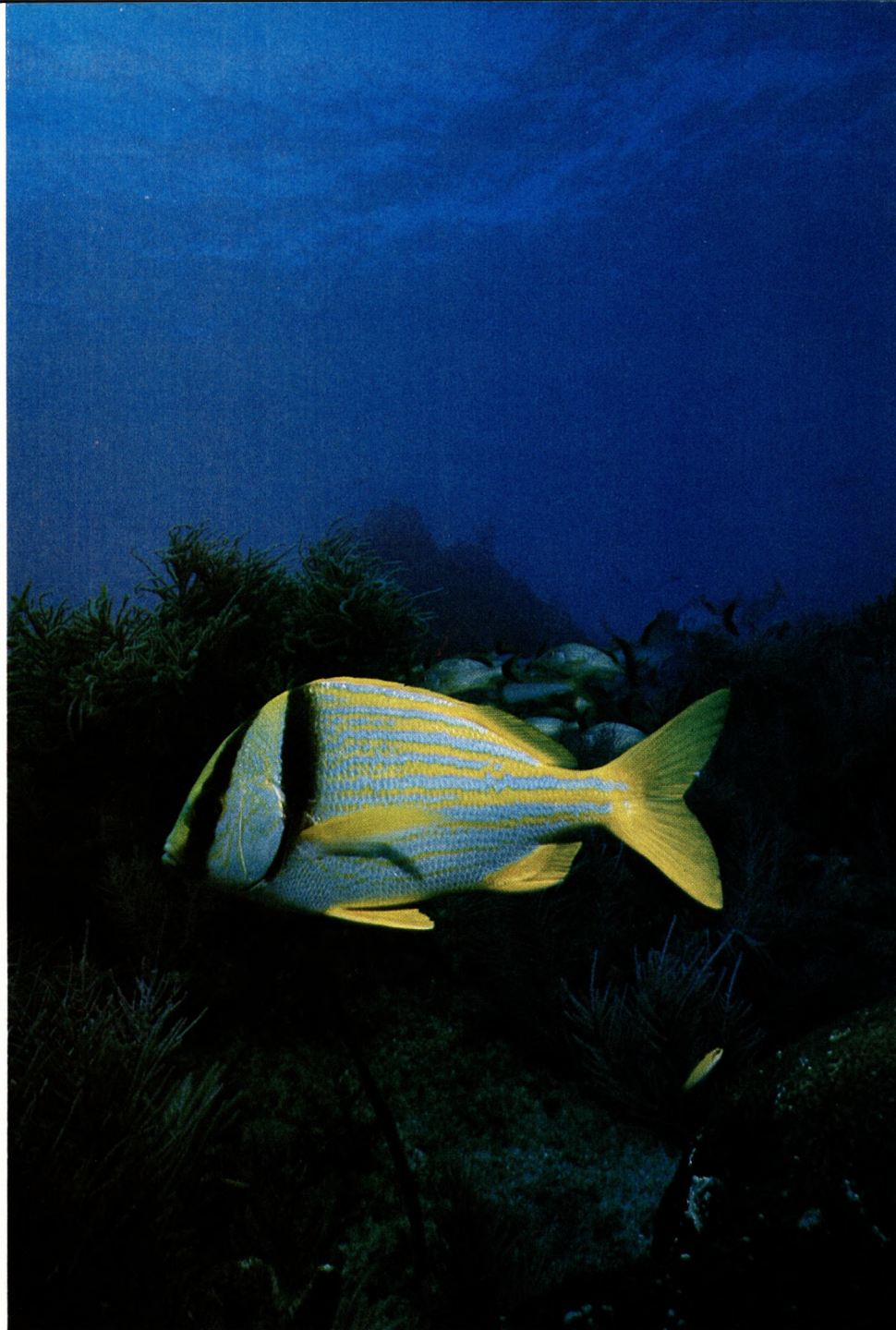
Still, it's hard to believe the island's underwater world hasn't been impacted on a grand scale. In Curacao a good reef can only be relative, and the walls at Piscadera Bay stay with you.

I said I had misgivings. But this report shouldn't preclude Curacao as a diving destination. There is something to be learned at every site.

But traveling divers are advised to consider Curacao's bright lights/big city atmosphere first, and its diving second.

A split week between Curacao and Bonaire could prove to be very satisfying, and a comparative reef analysis may be instructive.

As for myself, *Viva Curacao!* means Amstel and music along the Punda's Prinsensstraat.



RICK FREHSEE



CARL ROESSLER

Above: A porkfish patrols shallow reefs off Curacao. Right: An isolated stand of finger coral off Curacao's south shore.

SPORT DIVER DESTINATION DATA

CURACAO

GENERAL

Location: 35 miles north of Venezuela and 42 miles east of Aruba
 Size: 180 square miles
 Topography: hilly island with sloping beaches, rocky coastline
 Climate: tropical with 22 inches of precipitation annually
 Population: 165,000
 Largest towns: capital Willemstad
 Languages: Papiamentu, Spanish, Dutch, English
 Economy: 18% industrial, 82% tourism; major exports oil, liquor
 Monetary unit: N.A. Florin = \$0.57
 Diving season: year-round
 Tourist season: mid-Dec. – mid-April

DIVING

Water temperature: 70-80° F year-round
 Visibility: 150+ feet
 Depth of dives: 0-130 feet
 Currents: 0-3 knots
 Tidal fall: 2 feet
 Types of diving: reef, wreck, wall, night
 Skill level: novice, intermediate, advanced
 Dives per day: 3
 Diving craft: good
 Sights:
 Fish: angel, squirrelfish, porkfish, tropical reef fish
 Restrictions: illegal to detach any coral or transport coral, plants or shells; spearfishing prohibited

DIVING SERVICES

Instruction available: resort course, open-water certification
 Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, partial wet suit
 Equipment sales: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, BC, pressure gauge, depth gauge, compass, partial wet suit, Nikonos, underwater strobe
 Equipment repair: excellent
 Camera repair: none
 Air: to 3500 psi
 Guides: fair

DIVERSIONS

Ground transportation: bus, taxi, rental car
 Shopping: excellent and reasonable
 Restaurants: excellent and reasonable, average meal \$12



NETHERLAND ANTILLES

Nightlife: excellent
 Other sports: sailing, skiing, snorkeling, squash, golf, tennis, deep sea fishing
 Don't Miss: Fort Amsterdam, Floating Market, Mikve Synagogue, Curacao Liquor Factory

JUST IN CASE...

Hospitals: St. Elizabeth Hospital, Willemstad, ph: 24900
 Diving doctors: Dr. Kroon, St. Elizabeth Hospital, ph: 24900
 Recompression facilities: St. Elizabeth Hospital, ph: 24900
 Police: ph: 44444
 Marine Rescue: Channel 16, 156.80 mHz – monitored 24 hours
 American Express: Maduro & Sons, Inc., Heerenstraat 21, Willemstad, ph: 37900
 U.S. Consulate: ph: 13066

PLANNING

Diving tours: Curacao Watersports, Ben Van Dalen, ph: 25000, ext. 177; Caribbean Holiday, Joe Post, ph: 37200
 Land tours: Taber Tours, ph: 43845
 On your own: Airlines—American Airlines, (from New York) ph: 1-800-433-7300; ALM, (from Miami) ph: 305-526-6445
 Airports: Dr. Albert Plesman Airport
 Cruise Lines: Costa Lines, ph: 800-327-5704; Norwegian American Lines, ph: 212-422-3905; Princess Cruises, ph: 213-553-7000; Royal Caribbean Cruise Lines, ph: 800-327-6700; Sitmar Cruises, ph: 800-421-0880
 Marinas: Curacao Yacht Club; Hilton Marina, ph: 25000
 Accommodations: Airport Hotel Bianca, ph: 81120; Arthur Frommer Hotel, ph: 212-687-8866; Avila Beach Hotel, ph: 212-757-2981; Coral Cliff Hotel, ph: 800-223-6510; Curacao Hilton, ph: 212-594-4500; Curacao Plaza Hotel, ph: 800-323-8811; Country Inn, ph: 36600; Holiday Beach Hotel, ph: 25400; Hotel Madeira, ph: 53299; Madeira Inn, ph: 37500; Hotel Paris, ph: 24259; Park Hotel, ph: 23112; Princess Isles Hotel, ph: 305-253-0713; Hotel San Marco, ph: 12988
 Campgrounds: none
 Customs and Immigration: Requirements—proof of citizenship
 Import restrictions: none
 How much cash may you bring into the country? no limit
 Export restrictions: none
 How much native currency may you take out of the country? no limit
 U.S. Customs re-entry restrictions: duty-free to \$300

Where a notation "fair," "good," or "excellent" appears after an item, such as guides or diving craft, it refers to the *availability* not the quality of the services.

SUBSEA SAFARIS/DE PALM TOURS— ORANJESTAD, ARUBA ISLAND

Argentiniestraat 15, Oranjestad, Aruba, N.A. Phone: 4617.

RESERVATIONS: Subsea Safaris, c/o Harold Malmberg, L.G. Smith Blvd., Box 656, Oranjestad, Aruba, N.A. Phone overseas operator: 4400 or 4545.

LOCATION—Dive shop is located on beach between Sheraton and Caribbean Hotels on west side of island. 15 minutes from town and airport.

TRANSPORTATION—Air: ALM from Miami, American, Air Canada from New York. Ground: courtesy car pickup, taxi from airport \$4, car rentals available in town and at hotels.

ACCOMMODATIONS—De Palm Tours can arrange reservations at 10 hotels all within 2 mile radius of Subsea Safaris. Hotels range from first class to luxury, many with restaurants, bars, lounges with live entertainment and casinos. Complete water sports include waterskiing, fishing, pedal boats, glassbottom boat, sailing and snorkeling. Rates: prices range from reasonable to expensive. Most hotels accept major credit cards.

DIVING AVAILABLE—

Shallow reef **yes**
Mid reef **yes**
Deep reef **yes**

Walls **no**
Wrecks **yes**
Caverns **no**

Drift dives **no**
Night dives **yes**
Beach dives **yes**

DIVING EQUIPMENT—Rix compressor, 5000 PSI. 50 tanks 72 cu./ft. 2 dive boats include 36' converted Pilotboat, 21' Apollo with 40 total diver capacity. Full service retail store with complete gear rental, minor gear repair. Film in stock with 48 hr. processing.

DIVING SERVICES—PADI, NAUI affiliation. Five instructor/divemasters CPR first aid trained. Resort course \$35, underwater photography course available. Cost half day diving (2 tanks) \$25, full day (3 tanks) \$35, night dive \$25. Rate includes all gear, discount if own gear provided.

DIVING PACKAGES—De Palm Tours can arrange special packages and group rates at any of 10 hotels. Includes accommodations, meals, gear, diving, transfers. For complete details contact above address.

ARUBA IS A DIVING DESTINATION



Besides being one of the most continental islands in the Caribbean — Aruba has excellent diving. For complete information on reservations, water-sports, sightseeing tours, casinos and everything you need to know about Aruba, contact De Palm Tours.

TALK OF THE TOWN/MANCHEBO BEACH— ARUBA ISLAND

P.O. Box 564, Oranjestad, Aruba, Dutch Caribbean. Phone: 3380.

RESERVATIONS: Talk of the Town Resort, c/o Ralph Locke, 315 E. 72nd St., New York, N.Y. 10021. Phone: (212) 628-3319 or (212) 628-3476.

LOCATION—Resort is 200 yards away from ocean and beach on outskirts of town. 5 minutes from airport.

TRANSPORTATION—Air: ALM from Miami, American. Ground: taxi from airport \$3, courtesy pickup can be arranged, rental cars available in town.

ACCOMMODATIONS—64 air conditioned double rooms with private bath surrounding freshwater pool. Resort has 3 award winning restaurants, several bars, disco lounge and heated whirlpool. Water sports include sailing, fishing, snorkeling, waterskiing and moonlight cruises. Sister resort Manchebo Beach offers 72 air conditioned double rooms with French restaurant for complete dine around package. Rates: single \$29-48, double \$35-65, triple \$43-73, quad \$64-81. Summer rates. Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef **yes**
Mid reef **yes**
Deep reef **yes**

Walls **yes**
Wrecks **yes**
Caverns **no**

Drift dives **no**
Night dives **yes**
Beach dives **no**

DIVING EQUIPMENT—Compressor available, 3000 PSI. 15 tanks 72 cu./ft. 3 dive boats include 40' Trimaran, 20' Catamaran, 17' Whaler with 34 total diver capacity. Retail store with rental gear under construction April to July.

DIVING SERVICES—CMAS affiliation accept all major certifications. One instructor and divemaster each. Resort course \$35. Cost half day diving (1 tanks) \$20, full day (2 tanks) \$40, night dive \$40. All necessary gear included in rate.

DIVING PACKAGE—8 days/7 nights \$369 per person double occupancy. Includes accommodations, choice of 2 hotels, 2 meals/day, welcome drink, introductory scuba lesson, 6 dives, all gear, plus 50 more features. Non diver \$269 (PPDO), \$349 single. For complete information on diving packages contact above address.

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RESERVATIONS: Piscadera Watersports, Caribbean Holidays, 711 Third Avenue, New York, N.Y., 10017. Phone: (212) 573-8940.

LOCATION—Watersports at Hilton Hotel on the waterfront on south side of island. 10 minutes from downtown, 15 minutes from airport.

TRANSPORTATION—Air: ALM from Miami, American, Air Canada from New York. Ground: taxi from airport \$6, car rentals at airport.

ACCOMMODATIONS—Hilton Hotel has over 100 air conditioned double rooms with private bath and balcony. Half have ocean view. Hotel has private beach, casino, 3 bars, 2 restaurants, live entertainment, freshwater pool and several duty free shops. Water sports include deepsea fishing, windsurfing, waterskiing, sailing, glassbottom boats, pedal boats and snorkeling. Rates: single \$40-53 (summer), \$70-90 (winter), twin \$46-110 (summer), \$75-180 (winter), triple add \$16 (summer), \$25 (winter). 10% service charge and 5% room tax added. Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef **yes**

Mid reef **yes**

Deep reef **yes**

Walls **yes**

Wrecks **yes**

Caverns **yes**

Drift dives **no**

Night dives **yes**

Beach dives **yes**

DIVING EQUIPMENT—Ingersoll-Rand compressor, 2400 PSI. 42 tanks 72 cu/ft. 3 dive boats include 21' Outboard, 42' Sportfisherman, 65' Dolphin with 40 total diver capacity. Complete rental gear, film available, limited retail sales in future.

DIVING SERVICES—CMAS affiliation accept all major certifications. 2 instructor/divemasters CPR first aid trained. Resort course \$25, free snorkel lessons. Cost half day diving (1 tank) \$30, full day (2 tanks) \$50, night dive \$30. All necessary gear included in rate. Suggest bring own gear for comfort and convenience.

DIVING PACKAGES—8 day/7 night \$261 per person double occupancy. Includes accommodations, 6 boat dives, free admission and chips at casinos, bottle of liqueur, all basic gear, and other features. Write to above address for Pleasure Chest details.



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Body Position and Fin Technique

It's never too late to learn a few new kicks.

BY TOM MOUNT

What's your style of diving: Head up and feet down; or listing to port with butt high and elbows out? The configurations into which human beings can contort themselves wearing a scuba tank are endless, almost anatomically impossible. What we wouldn't give to be among those who seem blessed with naturally neutral buoyancy, whose dives are a symphony of effortless motion.

Good news. It's not natural ability that makes divers graceful—it's technique. That means you can learn to do it too. Employing good technique, swimming level and relaxed, you'll use less energy, less air and enjoy diving more.

The two basic elements of good technique are body positioning and proper propulsion. The diver who resembles a bundle of high pressure hoses and dangling straps cantering over the reef trailing a plume of silt is not only expending needless effort, but is lowering visibility for others.

Body Positioning

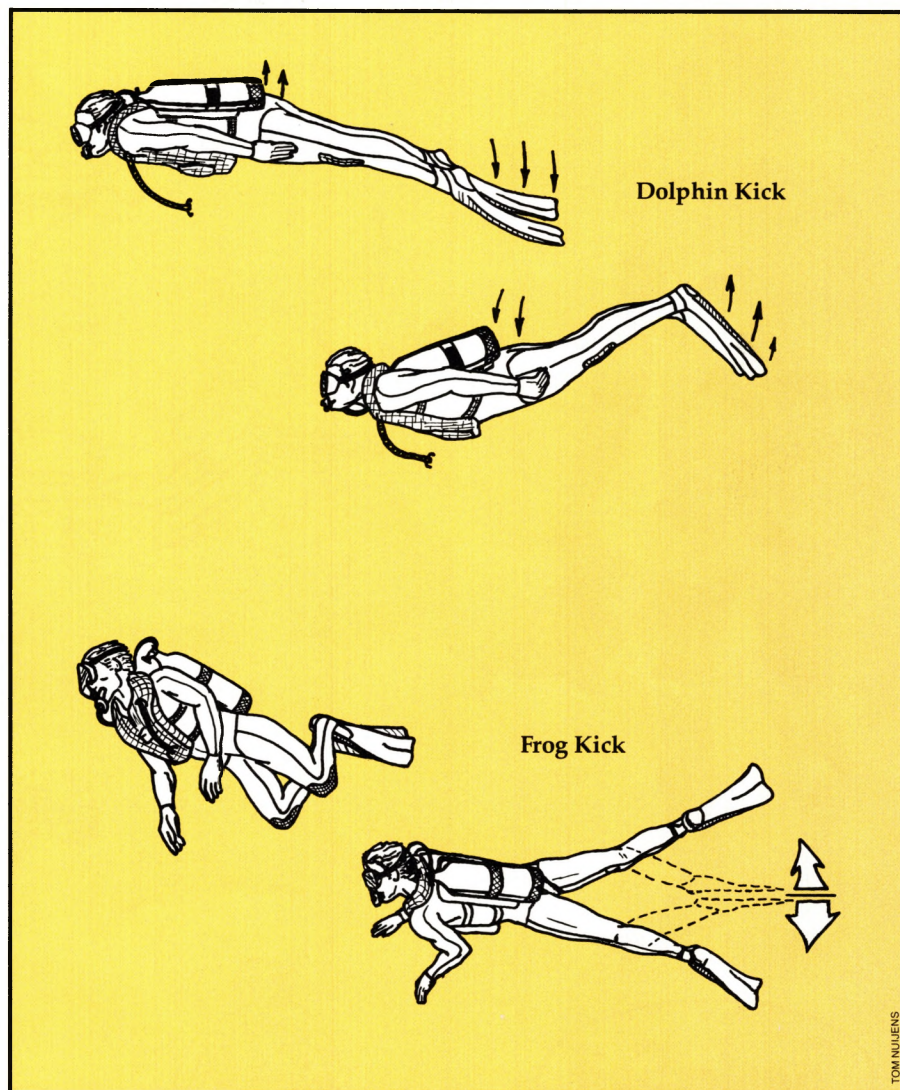
If you tend to swim with your head up and feet down, you may be overweighted. Overweighting is common, especially when moving from salt to fresh water or when changing to a thinner wet suit or diving without a suit. Recheck your buoyancy when you make a change of location or habit.

If you swim with your head down and feet up, you may be too buoyant. Again, straightening the body, keeping neutrally buoyant will create a minimum of drag, and your air and energy will go farther.

Propulsion

In accordance with Newton's Law, just

*Tom Mount is a past training director of the YMCA's underwater activities program and author of **Practical Diving**, **Safe Cave Diving** and the **Cave Diving Manual**.*



about any motion with your fins will cause movement. However, some motions are more efficient than others. Each type of kick uses slightly different muscles and best fits a slightly different situation. Obviously it's valuable to know three or four kicks, allowing you to trade off or compensate for a tired or cramping muscle.

The Dolphin Kick

The dolphin is very relaxing, and as it uses the stomach muscles, a real leg

saver. From a straight and level position, the torso is arched slightly and moved down as the legs are arched and bent upwards from the knees at a 45-degree angle. The legs are brought down smoothly, snapping the torso back to a level position and the process is repeated.

The Frog Kick

The frog kick looks odd, but is quite effective. Because the motion is side to side instead of up and down, it moves the stress of propulsion to entirely dif-

continued

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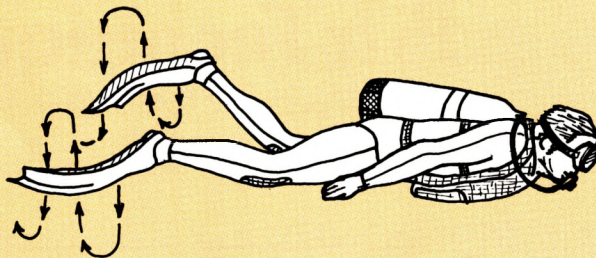
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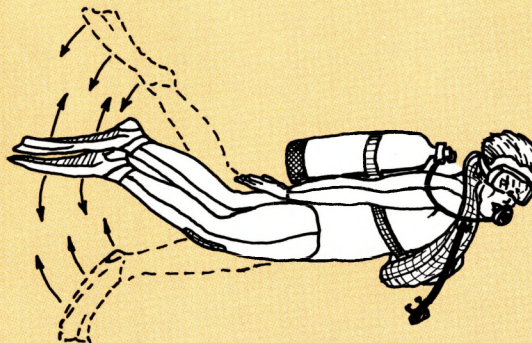
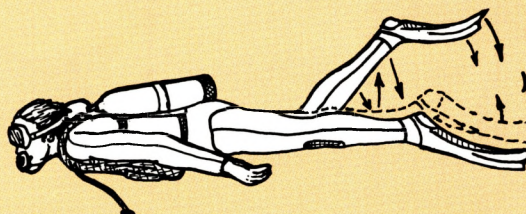
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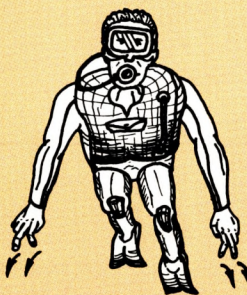
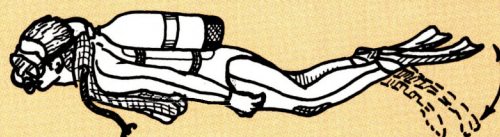
Flutter Kick

Shuffle Kick



Double Shuffle

Fin Sculling



Finger Walking



Hand Sculling

ferent locations. The knees are bent outwards with heels touching and blades sideways. Kick outwards with the legs, then bring them together forcefully. Keeping the blades sideways will produce maximum thrust.

Flutter Kick

The standard flutter is controlled primarily by the hips and hamstring muscles. The diver should maintain a slight flare, knees straight, legs pumping in a relaxed, slow and continuous rhythm.

Shuffle Kick

The shuffle is a great trade-off for resting a tired or cramped leg and reduces the disturbance in silty areas. The body is slightly flared with knees straight. One leg remains stationary, even with the hips and centered behind the body. The other leg is bent and lifted upwards, then brought down directly on top of the stationary leg.

Double Shuffle

In the double shuffle, the legs are centered behind the body. The upper leg kicks up while the lower leg kicks down, and they are brought back together, one on top of the other, at the centerline of the body.

Fin Sculling

To avoid silt in confined areas such as caverns or wrecks, try kicking only with the feet while your body is level and the knees are bent upwards.

Finger Walking

To avoid silt or travel through areas where kicking would be inappropriate, make a peace sign with both hands and pull yourself along the bottom. Be sure not to allow your knees or body to drag the bottom, and watch where you put your hands.

Hand Sculling

To maintain body position or to move backwards or sideways, extend the arm and make figure eights with your hand. Hand sculling avoids silt and is very useful in effecting slight position adjustments.

Don't wait until you're in open water with a badly cramped leg to practice these techniques; try them in a pool first. A small investment of time can yield a tremendous return of enjoyment and added safety to your next dive. ☺

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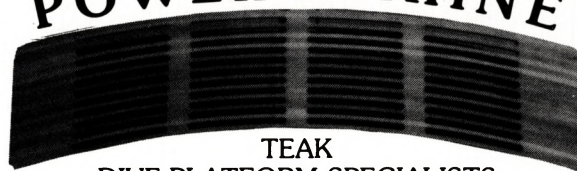
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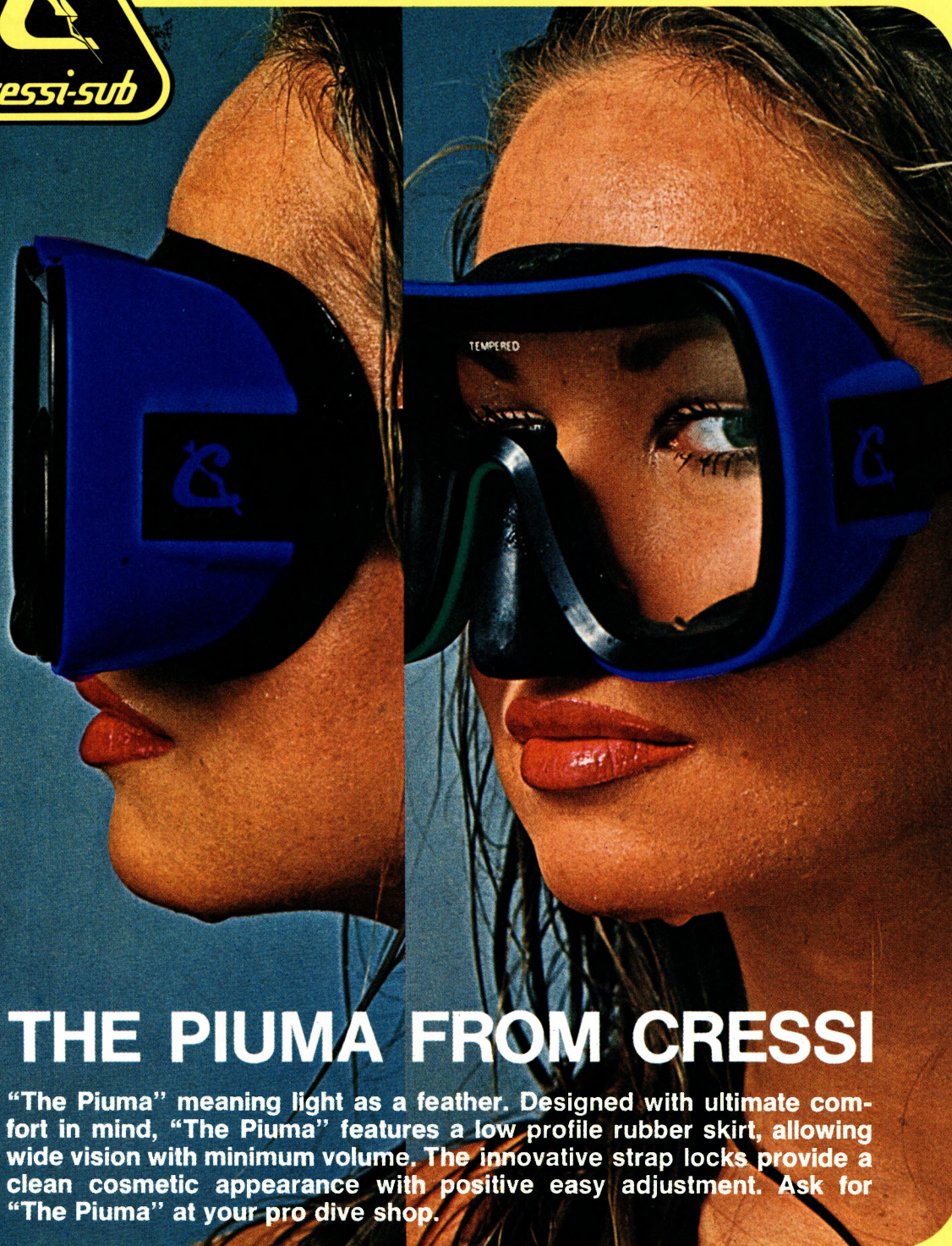
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Advanced Instruction:

Search and Recovery

*Lost objects are not hard to find
if you apply perseverance and the
right search pattern.*

BY STEVE BLOUNT

Oceans, lakes and rivers have a legendary and well-documented ability to reach up and purloin expensive goodies: Cameras, outboard motors, watches, wallets and wedding rings seem to be especially vulnerable to this kind of aquatic theft.

The victim's first reaction is shock and disbelief as to how the incident occurred; no victim has ever admitted to leaning overboard just before their watch jumped in. The second reaction will be to suggest that, since you're a diver, you go look for it. You may even have been the victim. In this case no prompting is necessary.

Even if the water is pitch black and the bottom covered with a thick layer of muck, a successful search and recovery can be effected if a few simple techniques are adopted.

The first of these is an imperative: Start the search where the object was last seen. Theorizing about current drift, path to the bottom and the buoyancy of the object will not be of any use because the result is speculative. Start with a known fact—where the object was last seen—then search in the probable direction of movement.

Successful recoveries are almost always based on thorough coverage of the area of loss. Make decisions about how much area will be covered, methods to be used, direction of search, how the object will be marked when found and line signals before the search begins. The standard line signals used in search activities are: One tug means stop or object found; two tugs mean proceed;

three or more tugs indicate an emergency, the searcher needs assistance. There are numerous search patterns and each has its adherents and supporters. Practically, there is no one pattern just right for every situation.

Circular

Often the first—and simplest—choice, this requires only two divers and some line. One diver is the anchor and remains stationary. The other swims in circles around the anchor diver, holding the search line taut. Each time he completes one circuit, the anchor diver lets out a little more line, increasing the diameter of the search circle. The searching diver moves out until the line is again taut and circles the anchor diver. The total diameter of the search pattern and the distance between sweeps are controlled by the visibility and the size of the object you're looking for. If you're trying to find a submerged elephant in a clear, flat-bottom lake, the anchor diver can pay out 75 feet of line in one or two sweeps. But if the object is a lost six-pack or a piece of jewelry, you may have to grope through the muck, paying out no more than one arm length (the search diver's arm's length) each time.

There are several variations of this pattern. A concrete anchor with a line swivel on it can relieve the anchor diver of some of the tedium. Attaching a buoy to the anchor will help in correctly spotting search areas. An anchor with search line attached can be let down from a boat and, with a tender above, the two divers can double the area searched on each sweep. The inside diver holds the line in his left hand,

searching with his right hand. The outside diver grasps the inside diver's tank harness with his left hand, searching with his right hand. After each complete circuit, they move out two arm lengths.

Arc

Another variation of the circle, the arc is useful where conditions prevent completion of a full circuit around the anchor. Instead of swimming 360°, the search diver turns and reverses direction after completing 180°. The anchor diver then pays out more line or moves the search pattern over by the length of the search line.

Square Spiral

This is a little more difficult. You need to be able to judge distance and use a compass fairly well. From the starting point, swim straight ahead ten feet, make a 90° turn to the left, swim ahead 15 feet, make a 90° turn and swim 20 feet again, then turn left (to your original heading), and swim 30 feet. On each succeeding leg, increase the distance swum by five feet. Every fourth leg match the distance swum to the preceding leg, then on the first leg of the next square increase the distance by ten feet. The formula is: leg one—length of the last leg plus ten feet; leg two—plus five feet; leg three—plus five feet; leg four—plus zero feet; leg five (leg one of the next square)—plus ten feet.

Cross Stream

When searching streams or river beds, the cross pattern is often practical. You'll need shore tenders and a weighted line

Steve Blount is the editor of Sport Diver.

continued

for this one. The line is passed across the water and hauled by tenders on each side. Weights on the line keep it submerged. If two divers are used, one holds on to the line with his right hand, the other with his left. With their free hands, they sweep the bottom while crossing. When they reach the opposite shore, the tenders move the line one arm length downstream and the process is repeated. If a number of divers are available, they should line up on the downstream side of the line. The lead diver grasps the search line with one hand, using the other to search. The other divers grasp the diver next to them using the hand closest to the line and use their free hand to sweep the bottom while the group crosses.

Grid

With practice, a grid search can be conducted by two divers, given good weather and water conditions. In rough conditions, tenders are necessary and safety divers are a wise precaution. Two long lines, weighted and buoyed at each end, are laid parallel underwater like a railroad track. A third length of line—the search line—is stretched between these two grid lines. Starting from opposite ends of the search line, divers cross from one grid line to the other along the search line. When they reach the opposite grid line, each diver moves the search line over an agreed distance and the procedure is repeated.

Snagline Search

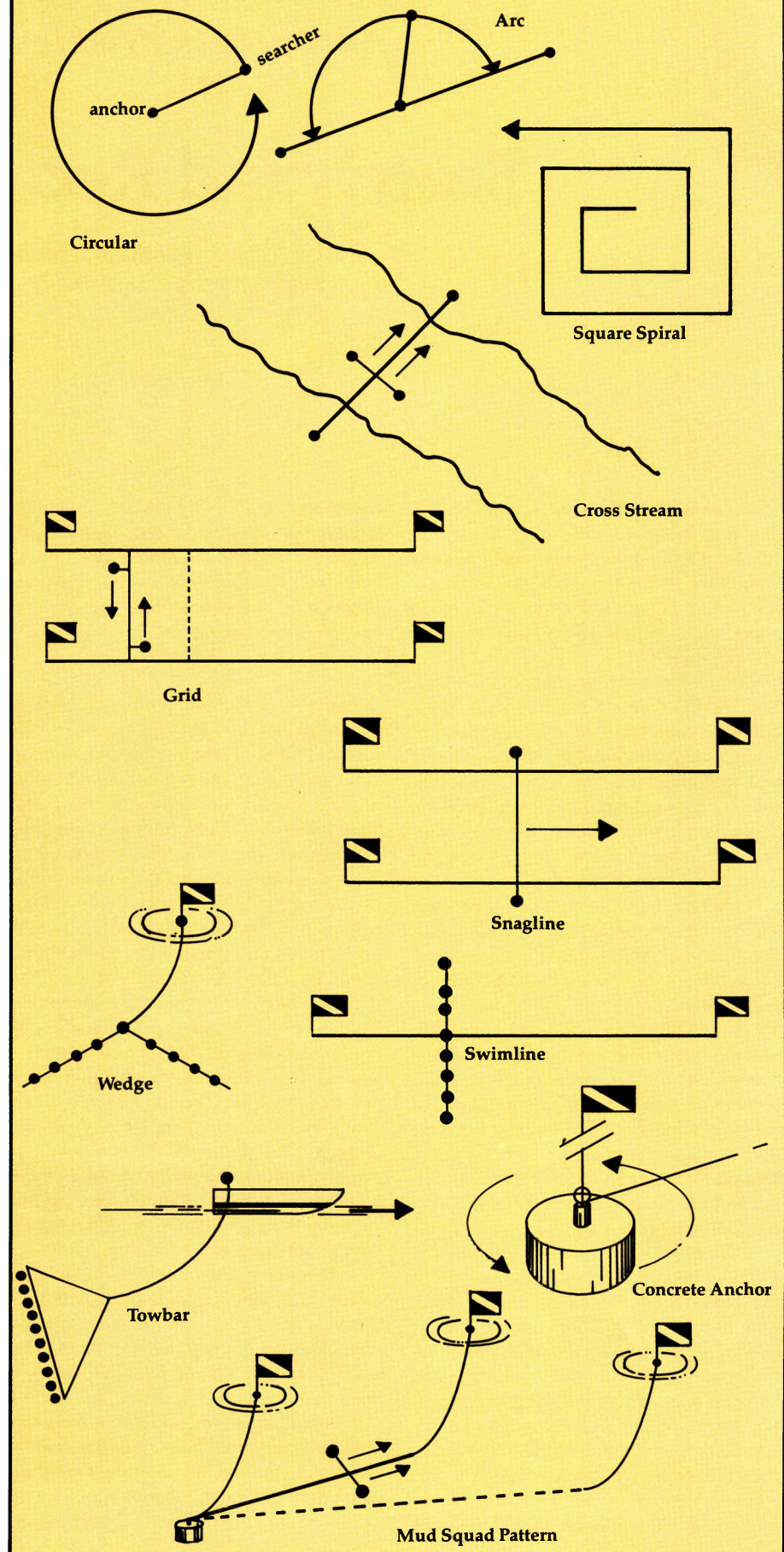
If the area to be searched is relatively free of obstructions and the lost object is of a suitable size, a snagline may be the most effective type of search. As in the grid search, two parallel grid lines are laid and weighted to the bottom. A snagline with hooks is substituted for the search line, and the divers swim parallel to the grid lines towing the snagline along the bottom.

Wedge

Like the football Flying Wedge, this maneuver takes a number of searchers. A diver on the surface holds one end of the search line, the lead diver on the bottom holds the other end. Divers line up on both sides of the lead diver. Those to the left hold on to the diver next to them with their right hands, searching with their left hands. Those to the right of the lead diver hold on to their buddies with their left hands, searching with

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Search Patterns

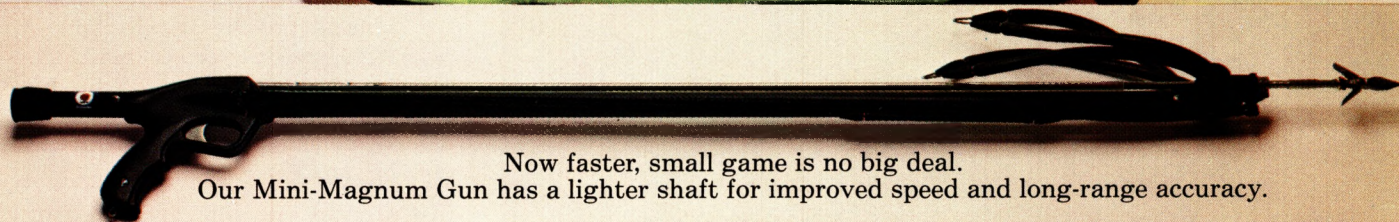


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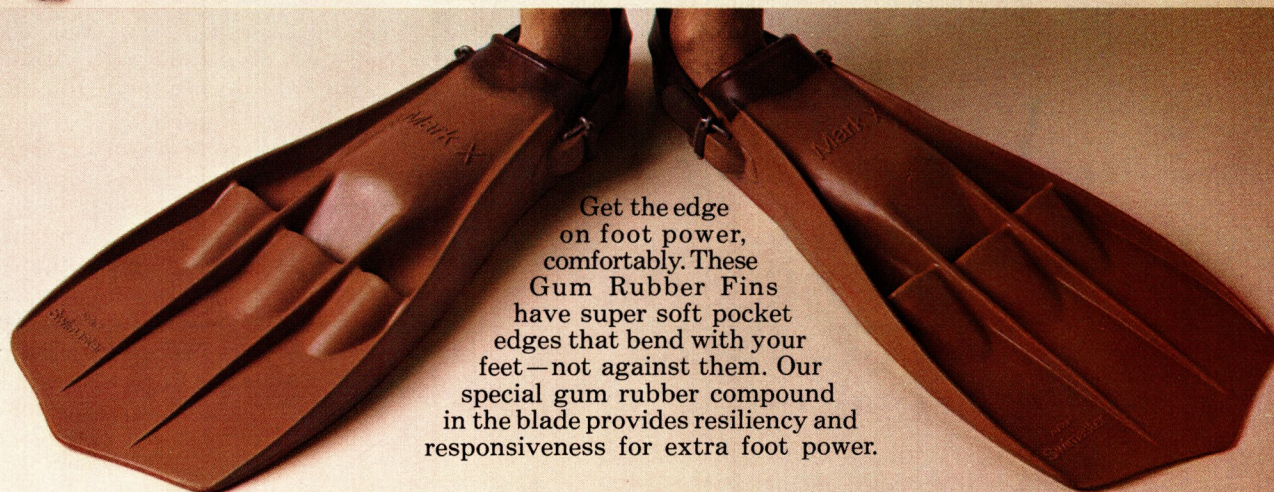


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SEARCH & RECOVERY *continued*

their right hands. By holding their arms stiff at a 45° angle, the divers will form a V pattern behind the lead diver. The surface diver leads the searchers below by means of the search line.

Swimline

This is good for wide area searches with a number of divers. A weighted base line is run out from a fast boat. The divers deploy at right angles to the base line, holding a search line between them. The middle diver swims along the base line and the others, spaced at appropriate intervals to his left and right, follow. When the length of the base line has been searched, it is moved to a new area and the procedure is repeated.

Boat Tow

A quick way to cover a large area is by boat tow. Divers line up along a tow bar made of steel or PVC sections, holding on with one hand and searching with the other. The bar is connected to a tow line, and the line is held by a tender in the back of a small boat. The tow line should be at least 50 feet long and, depending on the depth, long enough so that the angle of the line to the bottom does not exceed 30°. The boat should proceed cautiously at one to two mph, and the tender should be alert to receive tug signals from the search team. A diver who spots the object should signal the others, then drop off the bar and mark the spot with a buoy. The other divers should surface and stand by until he surfaces.

The Armand Rahn Mud Squad Pattern

Perfecting by ex-UDT man Armand Rahn and used by the Rochester, New York Police Scuba Squad, this pattern allows two divers to thoroughly search a wide area with a high degree of accuracy. Two inner tubes are placed on the surface secured by mushroom anchors. The tubes, the anchor lines and the anchors are spread apart by the length of a 50-foot search line that runs along the bottom from anchor to anchor. One diver grasps the search line in his right hand and the other diver holds the lead diver's right wrist with his left hand. Together they swim toward the second anchor fanning their arms out in front and to the side in a constantly overlapping semi-circle. When the divers reach the second anchor, the lead diver moves it a full arm span in the prearranged direction of the

Gearing Up

It's useful to have a few accessories beyond the standard tank/pressure gauge/depth gauge/watch/BC/octopus.

- A wrist compass is helpful in determining direction.
- A map or navigational chart of the area.
- Buoys can be used to mark the search area, warn off boaters, center search patterns and mark the object to be recovered. Inner tubes with diver's flags attached make serviceable and practical buoys. Also carry a small float or buoy with attached reel and line for marking your spot.
- For circular searches, a concrete anchor with a small diameter pipe sticking out of the top is helpful. Attach a line swivel to the pipe and a buoy to the anchor.
- A towbar for boat searches can be constructed of steel or PVC pipe joined by couplings. Don't forget you'll have to transport the towbar in somebody's car, so make the sections short enough to pack easily.
- Line. Searching usually takes lots of line to connect buddies, to outline the search area, to secure the object. Don't skimp here. Get a good synthetic line with high tensile strength that can stand up to the use and weather conditions you intend to subject it to. Nylon line sinks better than polypropylene so use it for grid and search lines.
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search pattern. Now the search line is on a diagonal to its original plane and the divers reverse direction. When they return to the first anchor, they move it one arm span so that the plane of the search line is parallel to the original and the pattern is repeated. One diver is always retracing ground that has already been explored.

Of course standard good dive procedure should always be followed while making a search. Dive with a buddy and stay in touch. Carefully monitor air supply and bottom time. Don't stick your hand in a hole before you know what's in there. And be sure to treat your fellow searchers to an appropriate libation when the diving's done.



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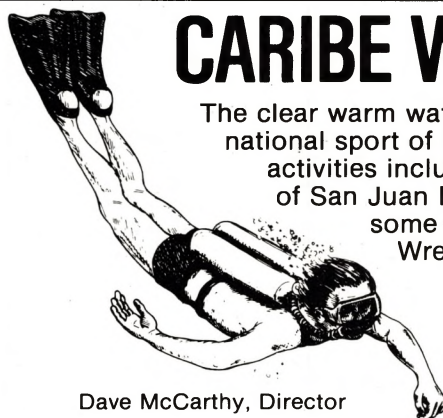
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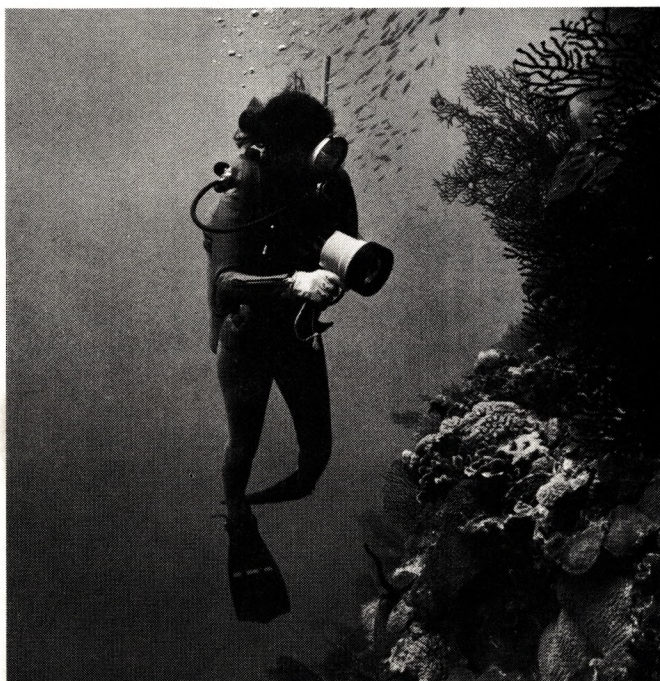
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Competition Rules

1. The PADI Underwater Photography Search Competition is open to all amateur photographers. Only underwater photographs will be accepted.
2. ALL ENTRIES MUST BE SUBMITTED TO A PARTICIPATING PADI TRAINING FACILITY FOR LOCAL JUDGING. Local winning entries will then be sent to PADI Headquarters for international judging. Applicants may enter as many photographs as they wish; Photographs may have been taken any time with no geographic restrictions.
3. An entrance form and a \$4.00 fee per entry to the participating Training Facility must accompany all photographs submitted. The completed form acknowledges reprint rights for PADI International when proper photographic credit is given. The utmost care and handling will be given all entries, but no responsibility will be assumed by PADI International or any PADI Training Facility. Photographers retain ownership, and all entries will be returned after the judging has been completed.
4. Winners shall be chosen in two categories: Color, and Black and White.
Color - Color entries should be mounted slides (transparencies) in plastic protective sleeves.
Black & White - All prints should be a minimum of 5" x 7" and a maximum of 8" x 10", glossy finish and mounted on an 8" x 10" mount board.
Participant's name, address, telephone number, and the title of the photo must be printed clearly on the back of each entry.
5. Local judging will be done by PADI Training Facility staff members, international judging will be done by the PADI Underwater Photography Search Competition Committee. Acting as advisors for the judging will be Jack McKenney, internationally known underwater photographer/film maker, and Bill MacDonald, Special Projects Director of the Cousteau Society.
6. Winners will be chosen by a point system based on technique, lighting, and composition. Decisions by judges shall be final.
7. The Search Competition shall begin July 1, 1979 and end October 31, 1979.

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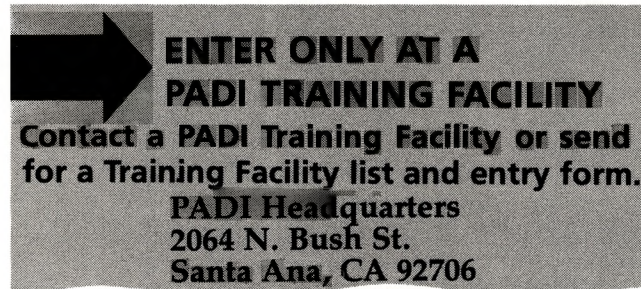
An eight day— seven night expense paid dive trip to beautiful San Salvador Island, at the Riding Rock Inn Resort (a PADI Five Star Training Facility). The winning photograph will also be used as the cover of *The Undersea Journal*, and will be featured at Underwater Photo Expo '80.

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PADI

TODAY'S LEADER IN DIVER EDUCATION

Diving Destination:

The Bay Islands

The most famous islands of the western Caribbean, Roatan and Guanaja have not succumbed to developers—yet.

BY YVETTE CARDOZO AND
JUDY BAGGETT THRASHER

RICK FREISEE



ANNE DOUBILET

Top: Anthony's Key, just off Roatan Island, viewed across a narrow channel from Bailey's Key. Above: Roatan, the southernmost island along the Central American barrier reef.

Roatan is the kind of place film location scouts suggest when central casting needs a good South Seas island setting for a running-naked-in-the-sand fantasy. All the standard ingredients are here: uncounted swaying palms, jungle mountains and friendly locals who don't even care to know about the latest oil crisis or aborted peace treaty.

The locals come in two types. The blacks prefer to be called Carib Indians, and indeed they are most likely descendants of this fierce, sea-going tribe.

The white Latins speak English with a lilting, distinctly British accent bequeathed them by their British pirate ancestors. Even though Roatan belongs to Honduras, the people here still refer to mainlanders as "The Spaniards." Those mainland Spaniards—undoubtedly bearing a grudge for centuries of harassment by pirates—returned this

Yvette Cardozo is a regular contributor to Sport Diver. Journalist Judy Thrasher has been published extensively on her Caribbean travels.

continued

sentiment for years by refusing to admit the Bay Islands existed. To this day, some Honduras maps simply do not include Roatan and its neighbors.

If you're a born barterer, come prepared. Roatan children have an insatiable appetite for gaudy T-shirts, tennis shoes, thongs and hats. They'll gladly trade black coral, shells and Indian artifacts (which they call yabba-ding-dings) for goodies from the U.S.

But what makes Roatan a choice vacation is what lies underwater. It is the southernmost link in a chain of islands that dot the Central American barrier reef, the world's second longest. Stands of unmarred antler coral lie within yards of shore. Parrot fish are so numerous and bold you can see them swimming in the breakers at the beach.

The reef on the north side begins in about six inches of water 150 yards from shore and in places coral heads break the surface. The reef drops away until, at 30 feet, the bottom fails, plunging to 120 feet. Layers of plate coral border massive clumps of branching coral, brilliantly colored threads in the vibrant organic fabric that cloaks the wall.

The island's north side is popular because it is protected from the wind. When a southeasterly blow comes in, it offers calmer water, better visibility and

better surface conditions than the south side. Sandy Bay dive operators send their boats through a channel in the barrier reef between Anthony's Key and Bailey's Key. In five to ten minutes they can reach a number of excellent sites.

Bear's Den is a cavern diver's delight. A narrow entrance in 30 feet of water opens into a room 12 feet by eight feet. Large schools of fish can be seen clearly in the muted light from the entrance and a hole in the cavern ceiling.

Where there are islands and coral,

there are always wrecks. At Man of War bight, the remains of the trawler *Gwendolyn* lie in 110 feet of water. She sank in 1953 after ramming the reef, settling slowly enough to allow the crew to escape. The hull, batteries and engines are easily accessible. There are other sites, less obvious and accessible, that link the island with its piratical heritage: piles of ballast stone said to be Spanish galleons.

Hole in the Wall is an enormous ravine which starts in 60 feet of water and slopes downward. The confining

Right: Bear's Den, a spectacular shallow cave site, opens only 30 feet from the surface. Below: Anemones in shallow water just off the north shore of Roatan.

RICK FREHSE



BOB WALLACE



limestone walls of the formation suddenly give way, ending in a bowl-shaped crater. The crater's outer lip is flattened, and crossing over its outer rim leaves you hanging over a sheer wall that drops to almost 3000 feet. Mammoth basket sponges, for which the island is famous, depend from the wall in great numbers. Trees of black coral forest the cliff, and visibility regularly reaches 200 feet.

Near the wall lies a bed of small eels. They resemble sea grass, gently swaying and dancing to an unheard

ocean song. But the sea grass disappears into a small hole as you pass over, reappearing in your wake as you cross the vast eel garden.

Around the west end of the island, phosphorescence turns each night dive into an eerie dream sequence. When you kick a flipper, showers of lightning-bug-green sparks fly in all directions, and fast swimmers light up head to toe.

The shoreline is undeveloped on this side, still pristine and primitive. White sand beaches are punctuated by

clumps of mangrove and palm at the foot of steep hills. The mountains of Honduras can be seen from the tops of these hills across the 30 miles of open channel water.

If you visit the area by boat, you'll probably be treated to a beach picnic at lunch. After a leisurely rest, a stroll on the beach and refiguring dive tables, you'll be anxious to get back on the reef. The coral starts deeper on the west end and levels off at 30 feet for some yards. The spur-and-groove plateau extends to the edge of yet another dropoff, this one ending at 120 feet.

Bermuda chub, yellow snapper, surgeon fish and assorted tropicals cruise the rich water at the wall's edge or cower in the shadow of large sponges.

For the exploration minded, history is only a short walk from the hotel. Island children love to guide tourists down obscure hilly pathways to the ceremonial and burial sites of pre-Columbian Indians. Some of the closer hills are only 15 minutes away, while others require a hike of two to three hours. Some of the paths are bordered by cool mountain creeks which wind beneath trees loaded with orchids—bright Christmas-like ornaments in this winterless land.

Along the beaches, families sit on their front porches to catch the breeze. Children carefully build play houses of fallen palm leaves.

Rental cars give access to other parts of the island. At Oak Ridge, village homes border a small inlet. At the water's edge, houses on stilts are held captive by the hills immediately behind. A dory provides the only mode of transport beyond this point. Some islanders can be persuaded to take tourists up the coast in their dories, opening up beaches and keys inaccessible by road, remote and seldom visited.

Thirty-five miles east of Roatan lies Guanaja, another jungle-clad mountain island. It's a tiny speck, less than 22 square miles, yet it has peaks which reach 1400 feet above sea level. The jeep-rutted roads of Roatan are strictly for the adventurous, but Guanaja has no roads at all. Visitors come and go by boat. After landing on an airstrip near Bonacca, visitors take a native dory through mangrove swamps to the Bayman Bay Club on the opposite side of the island. The club is inimitable

continued

Below: Visibility in the transparent waters off Guanaja can exceed 120 feet. Bottom: Tube sponges on Roatan's barrier reef.



RICK FREHSE



DAVID DOUBILET

island chic: native materials and modern conveniences in a delightfully clever combination.

As at Roatan, the beach diving around Guanaja is quite good. Just in front of the resort is a reef which typically is loaded with tropicals and anemones. Another 25 yards beyond is a champion stand of elkhorn coral. You can sample these reefs at your leisure. As the sun comes up around 5:30 a.m., you may find yourself starting the day at dawn with a snorkel, or taking a pre-dinner dip in the evening.

The other reefs are reached by boat, most are only a short distance from the resort. One of these is Variety Show Reef. The place is thick with triggerfish, long nose butterfly fish and hordes of other tropicals. They perform well for the divemaster or guests, an aquatic review complete with colorful costumes.

And the island has a unique geological formation: The Pinnacle. The base is 50 feet in diameter and starts at 130 feet. Almost perfectly symmetrical, the cone rises vertically over 70 feet, terminating in a flattened cap about 15 feet across. Red sponges and gorgonians dominate the Pinnacle, steadfastly clinging to its sides in defiance of gravity and good sense. Lying in relatively open water, the Pinnacle is a good place to look for the larger pelagic species, jacks, tarpon and schooling fish.

Exploration is more difficult on Guanaja. The people are friendly, but the terrain is not. Rugged foothills near the coast rapidly give way to honest-to-god mountains. The view from the top has got to be spectacular, but so is the pain involved. A boat ride through the mangroves is far less strenuous and a good afternoon diversion.

Like Roatan, Guanaja offers quietude; a relief from the pressure of high-rise hotels and asphalt. But it may not stay this way. The World Bank has included Roatan in a multi-million dollar development plan for Latin America.

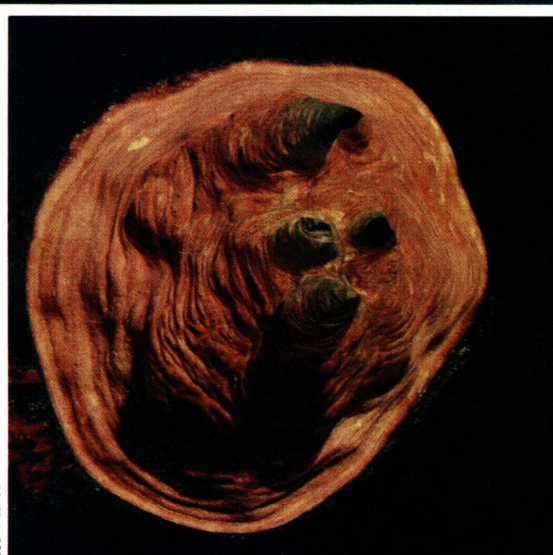
A World Bank official said diving will be emphasized but that "...obviously there's plenty of room for tourist expansion into other areas and activities."

Guanaja is the closest other area to Roatan. Like its neighbor, it may soon receive a major cosmopolitan face-lift—high-rise hotels, asphalt and perhaps a casino. Eventually quietude will be sacrificed for convenience, but for the time being, the Bay Islands still offer seclusion and spectacular diving. ☺



DAVID DOUBILET

Top: Roatan is famous for basket sponges in sizes that defy the imagination. Right: Top view of a Guanaja basket sponge.



BOB WALLACE

ROATAN

GENERAL

Location: 900 miles southwest of Miami and 800 miles southeast of Mexico City
 Size: 60 square miles
 Topography: a mountainous island with sloping beaches
 Climate: tropical with 45 inches of precipitation annually
 Population: 5000
 Largest town: Coxen's Hole (pop. 1000)
 Languages: English, Spanish
 Ethnic composition: 50% English extraction, 50% black Caribe
 Economy: 60% agricultural, 15% industrial, 25% tourism; major exports coconuts, fish
 Monetary unit: 2 Lempira = \$1.00 US
 Diving season: year-round
 Tourist season: year-round

DIVING

Water temperature: winter 74°-78°, summer 80°-84°F
 Visibility: 120-130 feet, rainy season September-November reduces visibility to 80 feet
 Depth of dives: 10-190 feet
 Currents: 0-1½ knots
 Tidal fall: 2 feet
 Types of diving: reef, wall, night, beach
 Skill level: novice, intermediate, advanced
 Dives per day: 3
 Diving craft: good
 Sights:
 Fish: eel, snapper, grouper, hogfish, grunt
 Coral: black, brain, elkhorn, fire, lettuce, pillar, rose, soft, staghorn, star
 Sponges: barrel, basket, tube
 Restrictions: No live coral may be taken.

DIVING SERVICES

Instruction available: resort course
 Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest
 Equipment sales: none
 Equipment repair: fair
 Camera repair: none
 Air: to 3000 psi
 Guides: good

DIVERSIONS

Ground transportation: taxi
 Shopping: none
 Restaurants: good and reasonable, average meal \$4-6 US
 Nightlife: none
 Other sports: sailing, horseback riding
 Don't Miss: prospecting for archaeological remains, visit archaeologists working off-shore wrecks

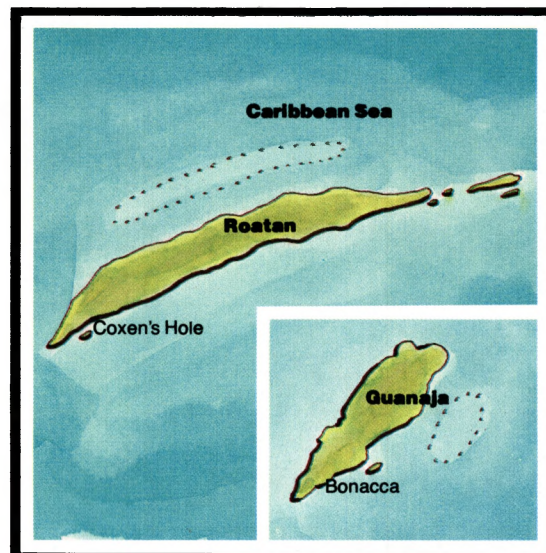
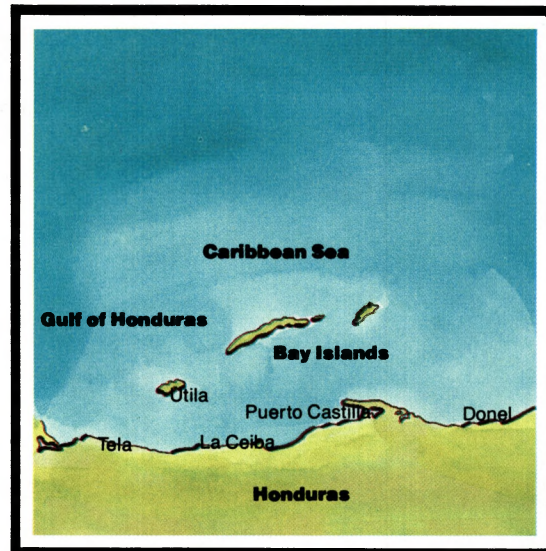
JUST IN CASE...

Hospitals: Standard Fruit Co. Hospital, La Ceiba, Honduras, C.A.
 Diving doctors: none
 Recompression facilities: none
 Police: Honduras army station in Coxen's Hole
 Marine Rescue: none
 American Express: Mundirama, Fiallof Soto Bldg., Tegucigalpa, Honduras, C.A.
 U.S. Consulate: Annette Veler, Avienda La Paz, Tegucigalpa, Honduras, C.A. ph-223110

PLANNING

Diving tours: Anthony's Key Resort, 3803 Wagonwheel Ct., Plano, TX 75023; Pirate's Den, Roatan, Bay Islands, Honduras, C.A.; Scuba Tours International, Lincoln Center, 5401 W. Kennedy Blvd., Suite 131, Tampa, FL 33609; Spyglass Hill, c/o Roseo Affiliates, 630 Northwestern Ave., Lake Forest, IL 60045
 On your own: Airlines—Belize Airways Ltd., 7220 NW 56th St., Miami, FL; SAHSA, 1440 Canal St., La Salle Bldg., New Orleans, LA 70112; TAN, 3120 NW 59th Ave., Miami, FL

SPORT DIVER DESTINATION DATA



BAY ISLANDS

Airports: Coxen's Hole
 Cruise lines: none
 Marinas: none
 Accommodations: Anthony's Key Resort, 3803 Wagonwheel Ct., Plano, TX 75023; Lost Paradise, Roatan, Bay Islands, Honduras, C.A.; Pirate's Den, Roatan, Bay Islands, Honduras, C.A.; Spyglass Hill, c/o Roseo Affiliates, 630 Northwestern Ave., Lake Forest, IL 60045.
 Campgrounds: none
 Customs and Immigration: Requirements—visa, passport and return air ticket
 Import restrictions: no firearms
 How much cash may you bring into the country? no restrictions

Export restrictions: You may not export Mayan artifacts or artifacts from shipwrecks.
 How much native currency may you take out of the country? no restriction
 U.S. Customs re-entry restrictions: \$300 worth of goods and currency duty free

GUANAJA

GENERAL

Location: 900 miles southwest of Miami and 900 miles southeast of Mexico City
 Size: 21.6 square miles
 Topography: a mountainous island with sloping beaches
 Climate: tropical with 45 inches of precipitation annually
 Population: 500
 Largest town: Bonacca (pop. 400)
 Languages: English, Spanish
 Ethnic composition: 50% English extraction, 50% black
 Economy: 80% agricultural, 10% industrial, 10% tourism
 Monetary unit: 2 Lempira = \$1.00 US
 Diving season: year-round
 Tourist season: year-round

DIVING

Water temperature: winter 74°-78°, summer 82°-85°F
 Visibility: 90-100 feet, rainy season November-December reduces visibility to 40-50 feet
 Depth of dives: 10-150 feet
 Currents: 0-1½ knots
 Tidal fall: 2 feet
 Types of diving: reef, wall, night, beach
 Skill level: novice, intermediate, advanced
 Dives per day: 2
 Diving craft: fair
 Sights:
 Fish: eel, snapper, grunt, tropical, grouper
 Coral: black, brain, elkhorn, fire, lettuce, pillar, rose, soft, staghorn, star
 Sponges: barrel, basket, tube
 Restrictions: No black coral may be taken.

DIVING SERVICES

Instruction available: resort course
 Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack, regulator, safety vest, BC, BC with inflator, pressure gauge
 Equipment sales: none
 Equipment repair: fair
 Camera repair: none
 Air: to 3000 psi
 Guides: good

DIVERSIONS

Ground transportation: no roads—all inland
 Shopping: fair and inexpensive
 Restaurants: fair and reasonable, average meal \$3-4 U.S.
 Nightlife: fair in Bonacca
 Other sports: water skiing, fishing
 Don't Miss: boat ride through interior of island, Mayan ruins at Copan on mainland

PLANNING

Diving tours: Bayman Bay Club, Guanaja, Bay Islands, Honduras, C.A.
 Land tours: none
 On your own: Airlines—Belize Airways Ltd., 7220 NW 36th St., Miami, FL; SAHSA, 1440 Canal St., La Salle Bldg., New Orleans, LA 70112; TAN, 3120 NW 59th Ave., Miami, FL
 Airports: Bonacca Air Field
 Cruise lines: none
 Marinas: none
 Accommodations: Bayman Bay Club, c/o Guanaja, Bay Islands, Honduras, C.A.; Guanaja Inn, c/o Guanaja, Bay Islands, Honduras, C.A.
 Campgrounds: none
 Customs and Immigration: See Roatan data

Where a notation "fair," "good," or "excellent" appears after an item, such as guides or diving craft, it refers to the *availability* not the quality of the services.

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UNDERWATER

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**Getting Started
on a Budget**

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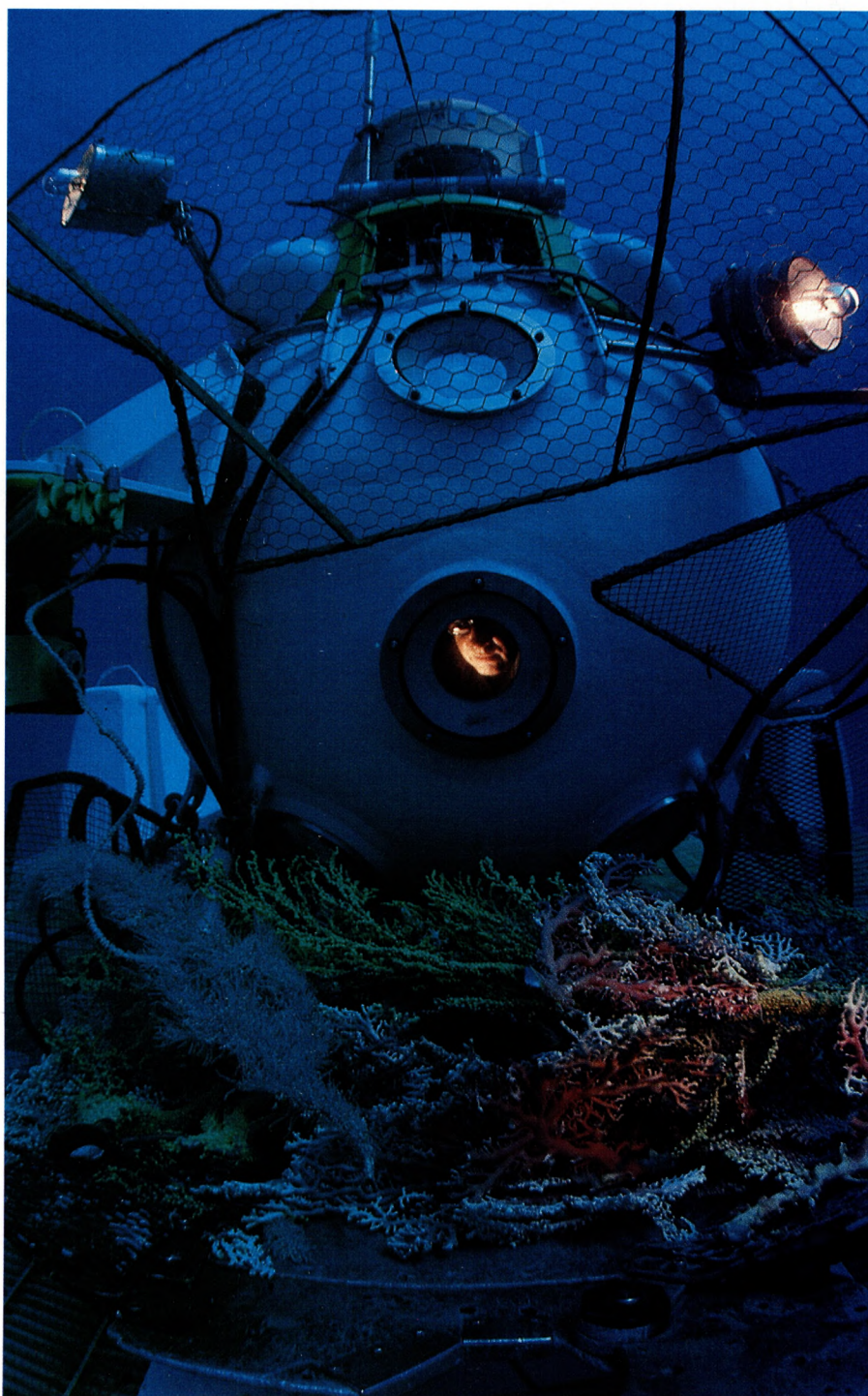
**Troubleshooting
Your Nikons**

Simple repairs
that can save
a shoot

Means and Methods:

**A Modified
Housing for
Easier Handling**

Homebuilt
improvements
for your stock
housing



DAVID DOUBILET

Getting Started on a Budget

*How to get your feet wet without
taking a bath.*

BY STEPHEN FRINK

I remember my first underwater photos. They were available light shots of Garibaldi taken with a Nikonos I, a \$12 swap meet bargain. They weren't particularly sharp or visually stimulating, but there was an element of excitement in taking the camera underwater, recording the image and emerging with dry film.

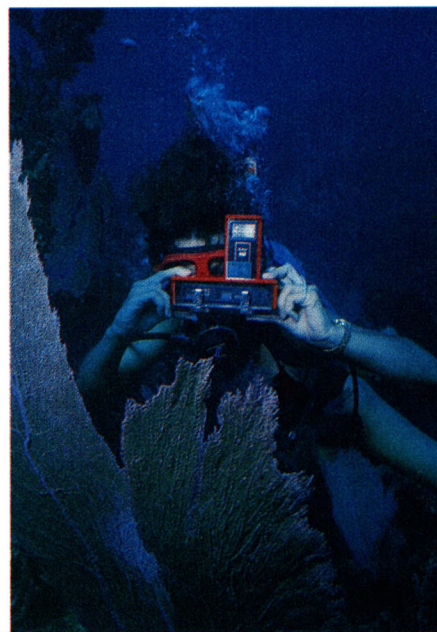
Unfortunately, the \$12 Nikonos is a rarity. Underwater camera systems can easily run more than \$1000 and are cumbersome to work with and transport. For the working pro, it's the cost of doing business; for the serious amateur, it's the price of self-expression. But if you're just getting started and aren't sure how much you'll like photography, it's hard to rationalize a major investment. But take heart, inexpensive alternatives do exist.

Usually, the cheapest way to break into underwater photography is to start out with a camera you already own. For 46 million Americans, that means a simple Instamatic. They are available in seven models using the 126 cartridge and 51 models that use the smaller 110 film format. These cameras cost from less than \$20 to more than \$100 depending on the features such as automatic exposure, glass lenses, rangefinder focus and integral flash.

The least expensive of these are cameras like the Kodak X-15 and X-15F in 126 and the Pocket 20 and Trimlite 18 in 110 (replaced this year by the Ektra series). They are pre-focused to form a sharp image topside at five feet to infinity. The exposure is also fixed (approximately 1/90th of a second at f 11) to give best results in bright sunlight with a medium ASA film such as Kodachrome 64 or Kodacolor II. Underwater these films will give good results in depths of five to ten feet on sunny days.

*Stephen Frink's photographs appear regularly in **Sport Diver**. He teaches underwater photography and operates a custom processing lab and photo rental facility in Key Largo, Florida.*

*Right: Kodak Tele-Ektra 110 camera
with Vivitar 118 strobe in Sea Research
housing. Below: Ewa-Marine housing
will protect any 35mm single lens
reflex camera.*

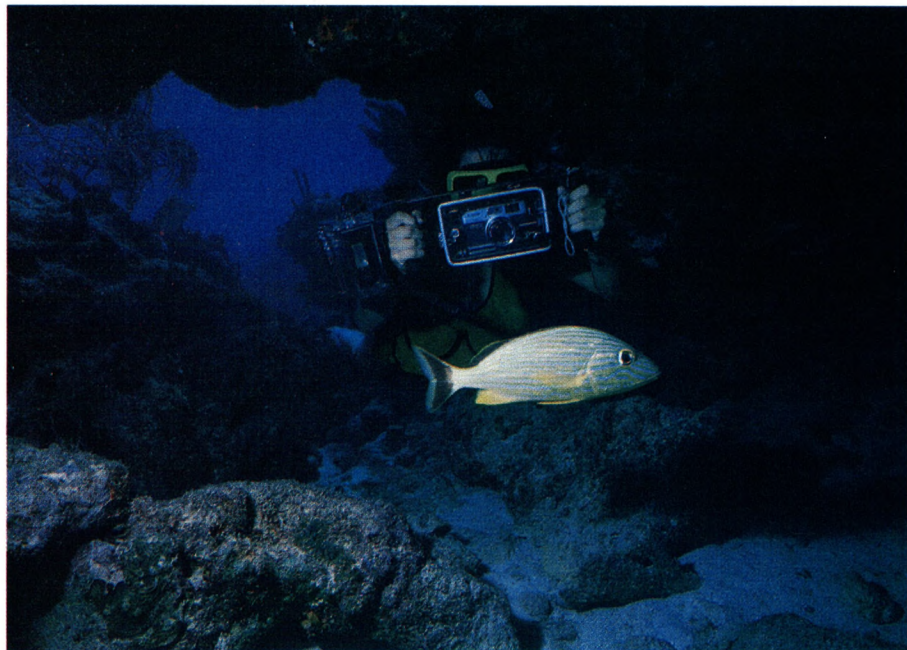


At greater depths a more sensitive film, such as Ektachrome 400, may be used, or flash cubes or bulbs which add light and restore color could be added. It is also possible to fool the camera and reduce the shutter speed by inserting the base of a used flash cube in the camera's socket before placing it in the housing. This will key a shutter speed of 1/40th of a second, allowing twice as much light to reach the film. Of course with the slower speed, camera motion and subject movement could blur the image, but shooting a relatively stationary subject should give you a sharp photo.

Sharper results in both available light and flash shots are possible by reducing the amount of water between the camera and subject, so move in closer. Because the lenses on many models are prefocused at five feet, the addition of a plus three (+3) diopter

is recommended. The diopter changes the focus range of the lens, allowing you to take sharp photos only two to five apparent feet from the subject. This can be taped outside the housing in front of the lens. An accessory close-up lens is available as an option for the Ikelite 110 housing. This diopter is enclosed in a plastic frame which snaps on the outside of the housing. The diopter slides in a track so it can be moved aside for more distant shots. It sells for \$24.95.

More advanced Instamatics are available with a built-in close-up facility allowing operation at three to six feet. This internal diopter used with the housing mounted close-up lens, affords practical close-ups from less than a foot to approximately 2½ feet. Composition at this range is more difficult because the viewfinder—which is above or to one side of the lens—does not see the same area the lens sees. A feel for aiming



Left: Canon G III 35mm SLR in Ikelite housing with Vivitar 201 strobe. Below left: Composition in grunt and staghorn shot with Canon G III and Vivitar 201. Below: Grunts in a Kodachrome exposure made by a Kodak Tele-Ektra 110 with Vivitar 118 strobe. Backscatter, pinpoints of light reflected from small particles of silt, is hard to avoid when strobe is mounted near the lens.



comes with practice and it soon becomes easy to frame pictures without use of the viewfinder.

The problem can be eliminated by using the Minolta 110 Zoom camera or the Pentax 110 SLR. These are single lens reflex units—the viewfinder sees exactly what the lens sees. However, both the cameras and their housings are significantly more expensive than conventional 110s.

Many top-of-the-line Instamatic type cameras feature automatic exposure. An electronic shutter adjusts to the ambient light of the scene and most compensate well underwater. With the Ektachrome 400 film, correct exposures are possible from the surface to a depth of 35 feet. Beyond that, the shutter speeds necessary would be too slow for underwater work. Here again, the use of a flash is advised.

Ikelite Underwater Systems is the

largest manufacturer of housings for both 110 and 126 formats. Their catalog lists 44 housings for these cameras and accessories allowing use of flash cubes underwater. Most of these sell for \$49.95.

For those who own an Instamatic camera, the Ikelite housing is the logical choice. However, Sea Research and Development offers an interesting camera/strobe/housing package for \$129.95. This includes the Kodak Tele-Ektra I camera which a Vivitar 118 electronic flash housed as a unit. As with the Ikelite housing, this very small, compact package handles well underwater.

The main advantages of these camera/housing combinations are the low price, small size and availability of film. Disadvantages include inferior optics on the least expensive models, small negatives with the 110s and the tendency of film advance gears to break because of the added torque needed to operate

through the housing. These cameras are easy to outgrow, especially in the area of flash or strobe work. Because the housings mount the flash so near the lens, in turbid water backscatter (white specks in the photograph) is inevitable. Still, they are fun cameras to use underwater and do record the image.

A significant step up is the 35mm rangefinder in a housing. Many feature automatic exposure control which is very accurate for underwater use. The optics are good even though lenses usually cannot be interchanged, and they accept electronic strobe.

Again, Ikelite manufactures the bulk of housings available for this kind of camera. Twenty-seven stock housings are offered at \$129.95 each, and most other cameras can be adapted to the standard housing mold by the factory for another \$20. These housings allow access to the shutter release, film ad-

continued

vance, focus and aperture control on most cameras. Many also provide mounts for optical viewfinders. The cameras range from \$59.95 for the Olympus Trip-35 to more than \$1000 for the Leica M4. Most cost less than \$100.

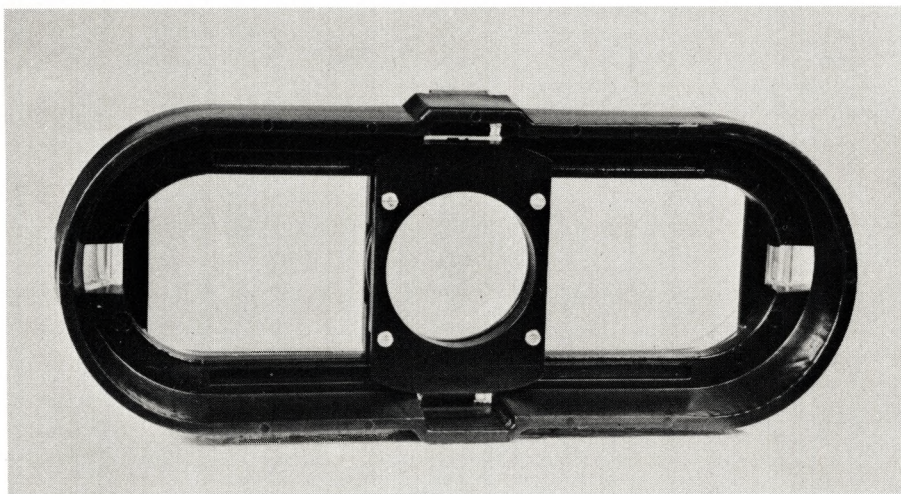
The nature of the moving underwater subject and working through a housing make rangefinder focusing difficult. Therefore a highly light sensitive film used with a small lens aperture is recommended. Depth of field is extended and the odds of getting the subject in sharp focus are increased. Just as with the Nikonos, the camera to subject distance must be estimated.

Many of these cameras have a leaf shutter, a distinct advantage for strobe lit photos. The leaf shutter permits the strobe to synchronize at any shutter speed and simplifies the matching of strobe to ambient light. This is evident in the following example:

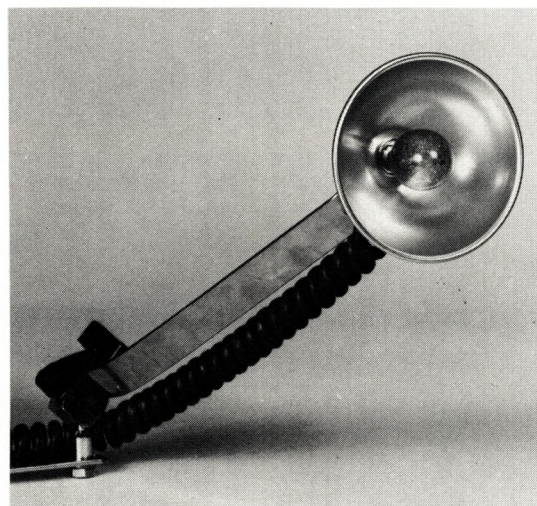
Assume that with ASA 200 film the camera is properly assessing the ambient light level at 1/125th of a second at f8. At three feet from the subject, the strobe is generating enough light to require an exposure of f11. To prevent the strobe from overpowering the available light, the strobe can be backed off from the subject. However, the increased water column will tinge the light blue and diminish the strobe's effectiveness. With the leaf shutter, you can check the camera's meter until you find the shutter speed which matches the exposure required by the strobe. In this case, 1/60th of a second would yield f11. You can alter shutter speeds and still remain in synch while using the strobe in a fixed position as well as vary the fill/ambient ratio.

The third inexpensive way to use your camera underwater is by using the flexible camera housing. Ewa makes a soft vinyl bag with an optical port which will accommodate almost any 35mm SLR and keep it dry to depths of 30 feet.

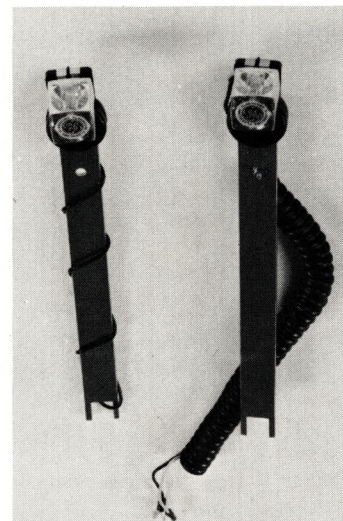
The housing works like a sophisticated Ziploc baggie. Simply enclose your right hand in the housing's built-in watertight glove. Through this glove, all the camera functions such as focus, aperture, shutter speed, film advance and shutter release can be manipulated as in topside use. Because the housing is clear vinyl, you can easily see the controls. Water pressure keeps the glass port pressed against the camera lens allowing use of lenses as wide as 28mm without the aberrations associated with a



Above: An optional closeup lens accessory for the Ikelite 110 housing sells for \$24.95.



Above: A bulb flash arm mounted externally on an underwater housing can be an inexpensive alternative to a strobe. Right: Even standard flash cubes can be used with most housings. External mounting helps avoid problems with backscatter.



Buyer's Guide

Inexpensive underwater housings are distributed by:

Ikelite Underwater Systems
3303 N. Illinois Street
Indianapolis, IN 46208

Pioneer and Co.
900 Haddon Avenue
Collingswood, NJ 08108

Sea Research and Development
P.O. Box 589
Bartow, FL 33830

Your local pro dive retailer may stock one or more of these housings and will be able to render advice on the best camera/housing combination for your use.

wide angle behind a flat port. The rear of the housing has a similar viewing port designed to align with the prism finder of the SLR.

An electronic flash can also be used

inside the standard housing (model "F" \$54.95) and gripped from outside the housing with the left hand. Again, the proximity of the strobe to the lens is likely to cause backscatter unless you

working close to the subject.

It's scary to take an expensive camera below in one of these housings. I tested mine initially with a Nikonos inside so if it flooded, no harm would be done. But it didn't leak even at 45 feet.

Eventually I got brave enough to put a Nikon inside for snorkeling shots, but I was never totally free of apprehension.

Since it is flexible, Ewa will fit nicely inside a suitcase and the cost is small compared with any other SLR housing.

Of course, there is no way it will provide the protection or ease of handling of a metal or plexiglass housing. But for topside use in inclement weather or underwater at shallow depths, the Ewa can be a very functional tool.

Underwater Photography/With the Pros:

Maintenance and Field Repairs

Preventing, diagnosing and curing minor problems.

BY RODNEY WOOD

A professional's reputation depends on performance: the ability to bring back photographs—every time.

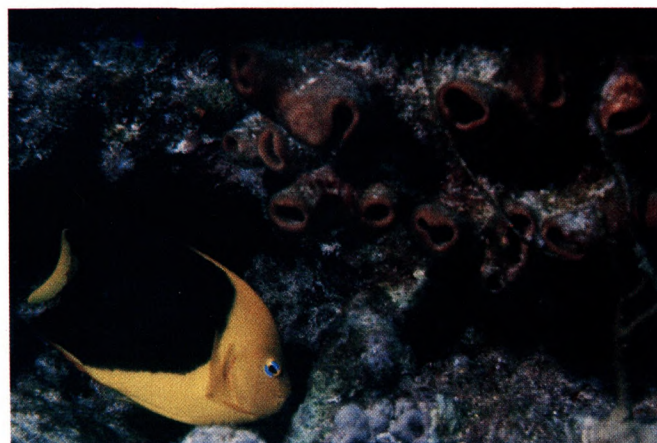
If you ask any ten pros what affects their performance, they would likely disagree on all points but one: That proper equipment maintenance, preparation and the ability to detect and repair minor malfunctions is essential.

While there are many types and brands of cameras in use underwater, none is more widely used than the Nikonos system. It is versatile and rugged, but like all instruments, it needs care and fine tuning.

To allow time for any necessary repairs, check your Nikonos thoroughly at least one month before a planned trip or shoot. This doesn't guarantee you'll succeed, but it does give you the best chance for successful photographs.

O-Rings

Remove the lens from the camera body, then remove the O-rings from both lens and body. They should look slightly shiny and be round, smooth and free of blemishes. If there is any doubt, replace them. If they check out, wipe them with a lint-free cloth and regrease lightly with silicone grease. Clean the O-ring grooves with cotton swabs and alcohol, removing all old O-ring grease and dirt. After the grooves dry, grease them lightly



Left: A black bar across the top or bottom of the frame means your shutter and flash need to be synchronized.

using silicone grease and a cotton swab. Caution here: Use only enough grease to cover the surfaces lightly. Too much grease could cause the O-ring to slip under pressure and flood your camera.

Lift the rewind knob and grease the shaft lightly, working the knob up and down to lubricate the internal O-ring.

The Shutter

If the camera has been stored for some time, the shutter spring may have suffered some compression—gotten lazy—throwing the shutter out of calibration. Working the shutter 30 to 40 times will normally cure this.

Flash Contacts

Remove the plug from the flash socket and check the contacts for corrosion. Clean the contacts with a typewriter eraser, or if corrosion is heavy, use a cotton swab soaked in white vinegar. Clean off excess liquid with the dry end of the swab. Be careful not to bend or damage the flash contacts, especially on the Nikonos II, as they are very brittle.

Check the flash socket threads for

damage—they are easily stripped by improper insertion of the flash plug. Clean the threads with a small, stiff brush, like a toothbrush. If the threads are damaged or stripped, have them replaced by an authorized repair facility. It's an easy job, but it does take time.

Connect your flash or strobe to the camera and check that it fires when you release the shutter. If it doesn't, short the contacts on the flash connector to insure the flash is working. If the flash is okay, examine the contacts in the flash socket. On the Nikonos II or earlier models, they may need to be bent slightly. Be extra cautious not to break the contacts. If the strobe still doesn't fire, check the contacts between the inner body and the body shell. They may need cleaning or bending.

Synchronization

If the shutter and flash are not fully synchronized, your photographs will be incompletely exposed with a black bar across the top or bottom of the frame.

Remove the inner body and take off the film pressure plate by removing one

Rodney Wood is a Nikonos repair technician and underwater photographer. This is his first contribution to Sport Diver.

continued

of the two fixing screws. Connect a strobe to the two outer synch connectors on the body by means of a modified synch lead with two small crocodile clips on one end. Set the shutter speed at 1/60th of a second and hold the camera in front of the strobe. Hold the film pressure plate over the shutter, leaving a small slit at the bottom of the shutter. Fire the shutter several times, reducing the size of the slit each time. If you can see light from the strobe coming through even the smallest slit, the shutter is synched. If the bottom checks out, follow the same procedure, leaving the slit at the top of the shutter.

If there is a small part of the picture area not being exposed, try slightly bending the lower synch contact on the inside of the synch plate. If the black bar (or unexposed portion) is at the bottom of the shutter, the strobe is firing early and the contacts should be opened slightly. If the black bar is at the top of the shutter, the strobe is firing late, and the contacts should be closed slightly. If a small adjustment of the contacts does not cure the problem, quit bending—it's likely that either the shutter speeds need recalibration or that the shutter mechanism needs an overhaul. Have the camera checked by a professional.

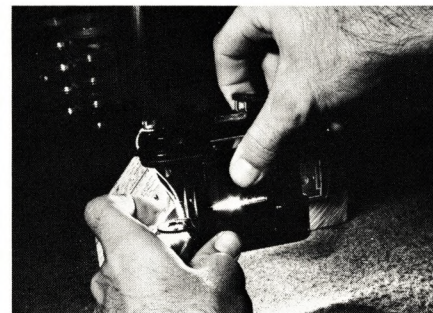
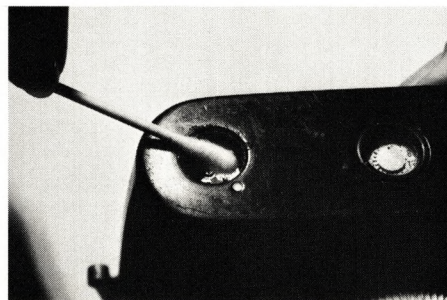
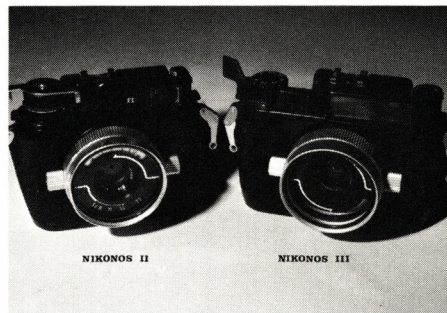
Film Advance

The use of accessory thumb releases is the root of a host of Nikonos problems. The extra torque they put on the winder can spread the forks on the end of the wind shaft or even twist the shaft. If the accessory release is attached at an angle, it could bend the wind lever up slightly, breaking the O-ring seal and causing the camera to flood. Check your winding shaft to ensure that it is true and well seated with its O-ring.

If the frames on your film overlap consistently, the ratchet on the film take-up spool may be damaged. This is usually caused by rewinding the film without setting the shutter speed knob to the R position. If the ratchet is damaged, it will have to be replaced.

Frame Counter

It is not uncommon for the frame counter to stop working on the Nikonos II. Usually, the pin in the bottom of the body shell has broken, or the counter has been corroded by small amounts of water accumulating in the bottom of the inner body. Check for corrosion, and if



Top: This is how they should look. Middle: You'll need a jeweler's screwdriver to remove the film pressure plate. Above: Clean the flash contacts and threads with cotton swabs.

Top: Checking for correct synchronization between shutter and flash. Middle: Check and clean or replace O-rings frequently. Above: Very lightly grease the rewind shaft with silicone lubricant.

Your Nikonos

At the Dive Site

- Do not leave the camera in the sun. Heat may cause color shift in film or leakage through O-ring extrusion.
- Do not jump into the water holding your camera, have someone hand it to you.
- Rinse camera with fresh water and air blow it dry before reloading.
- Periodically remove the flash plug and clean and grease the threads.

Shipping

- If you ship your Nikonos for repair:
- Package the camera carefully.
 - Do not send straps, cases or grips.
 - Enclose a short note describing the problem.
 - If unusual lines or spots occur in your photographs, enclose a sample.
 - Specify whether you desire an estimate.
 - Insure the package.

it is evident, the camera may need a general overhaul. If the body pin is broken, your only recourse is to replace the entire outer body shell.

The O-ring around the frame counter window should be checked and

replaced if necessary.

Lens

The only problem you're likely to encounter with the Underwater Nikkor lenses is a stripped focus gear—generally

the result of rough treatment. Hold the lens in front of you and rotate the focus control from one end of its travel to the other. The rear element should move in

or out about 1/8th of an inch. If it doesn't, take it to a professional repair center.

Proper preparation and maintenance of your photographic equipment is

the first step towards professionalism. It doesn't matter how good your eye is, if your camera isn't working, you're not going to get a photograph.

Underwater Photography/Means and Methods:

Easy Modifications for Easier Handling

A few simple changes can make your housed SLR handle faster and focus more accurately.

BY FRED BAVENDAM

While it produces excellent underwater results, the housed SLR camera can be difficult to handle at times. Fortunately, there are ways to ease the pain.

For the past several years I have used the Ikelite housings, and during that time there have been a series of improvements made in them by Ikelite. To these I have added a few personal modifications that further improve the handling. While I use the Canon F-1 and an Ikelite housing, certainly these modifications apply to other makes of cameras and can be adjusted to work with other housings as well.

Eyepiece Modification

The lexan used in the body casting is not truly clear, and as the housing gets older and gets scratched, it becomes less so. While the viewing area is made of lexan, the lens port is made of glass. The result is that, while your lens can see out clearly to take the picture, you can't see in clearly to focus. Ikelite suggests you set one distance on the focus and hope you'll have enough depth of field to cover the subject.

A better solution is to install a clear eyepiece. Have a machine shop cut out a section of lexan where the eyepiece is located. Then install a window of plate glass and seal it in place with silicon glue. Have the machinist make a small ledge or lip inside the outer edge of the hole for the glass to butt against. This ledge keeps water pressure from push-

ing the glass out of position. Also, bevel the corners of the outward surface of the glass. To install the window, put a considerable excess of glue on the full perimeter of the ledge, then press the glass into place. Squirt another layer of glue in the small trough between the housing and the beveled edge of the glass. After the glue has set for 24 hours, trim off the excess with a razor blade.

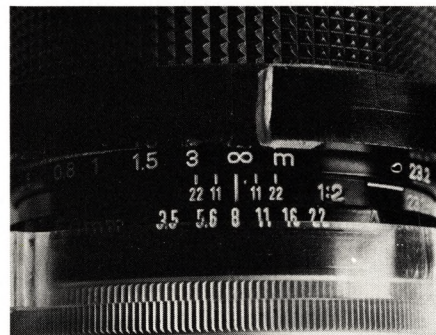
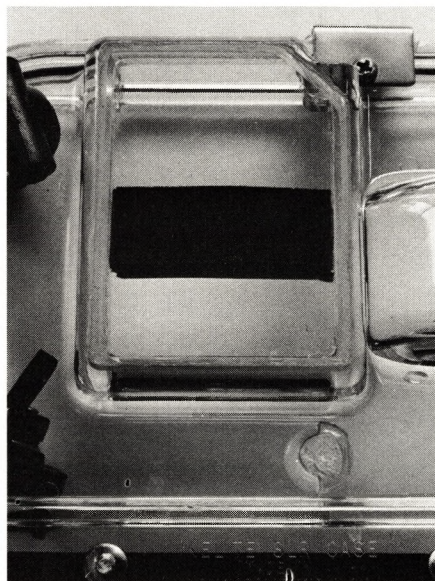
My machinist charges \$10 for cutting the hole, and the glass, cut to size and beveled, costs \$2. As a precaution, check the housing by submerging it while empty before using it with your camera.

Preset Focus Scales

Accurately focusing ultra-wide angle lenses through the eyepiece is difficult, even on dry land in good light levels.

The inherent depth of field of these lenses, even at maximum aperture, makes focusing even more difficult underwater where the light level is lower and things aren't seen clearly. Ikelite's clear housing makes it simple to incorporate a set of predetermined focusing points into the focus mechanism. To make this work, you'll need to adopt a set of working procedures and follow them consistently.

Attach the focus control ring to the lens barrel so one of the two notches coincides with the infinity mark on the lens collar. I have added little tabs to the notches of the focus control ring that eliminate most of the play caused by the difference in size of these notches and the size of the ribs of the focus control collar.



Above: A small pad taped to one side of the notch helps eliminate slack between the focusing ring and the collar. Left: A plate glass eyepiece installed in place of the lexan port facilitates focusing in low light.

Fred Bavendam's work has appeared in National Wildlife, Yankee Magazine and Sport Diver.

continued

Make a focus scale out of paper and attach it to the outermost edge of the focus collar where it extends beyond the body shell into the lens port. Each lens requires a different focus scale, so buy a separate collar for each.

Pick a reference point on the housing or port to match the scale against. You may use the central structural rib with the macro port or a notch cut in the new lens shade for the dome port.

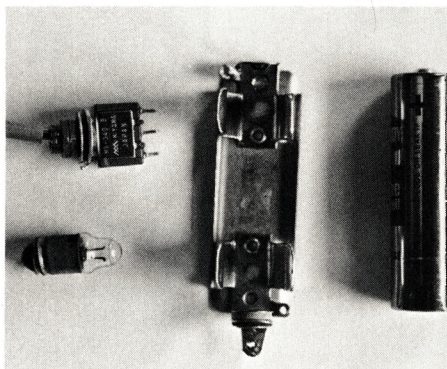
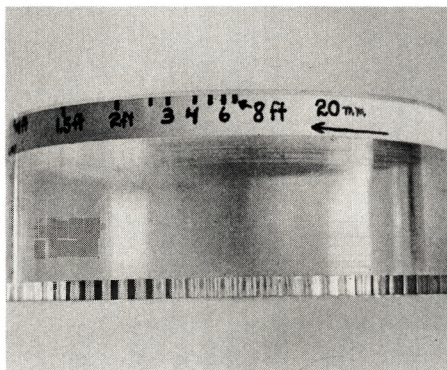
The most involved part of this is making the scale to attach to the lens collar. With a flat port you can mark the collar with the same distances that are on the lens barrel. However, a dome port forms an apparent image which you must focus on; an image much closer than the real subject.

Work the scale out in a pool with your camera, lens and housing combination. Measure off distances from one to 20 "feet" in units of 16 inches. Because things appear 25 per cent closer to your eye than they actually are underwater, 16 real inches equals one apparent foot. Focus as accurately as you can at different distances, noting where each distance falls on the camera's focus scale. Then make your paper collar to coincide with the new focus scale you've created. With the paper focus scale you will be able to set distances quickly when you may not have time to try to focus through the viewfinder.

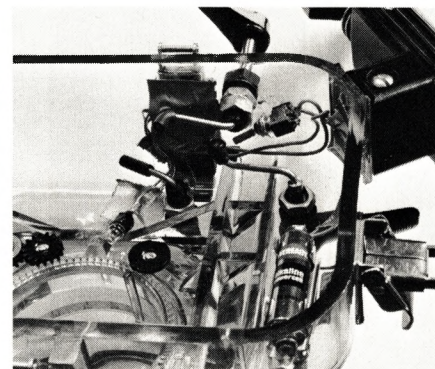
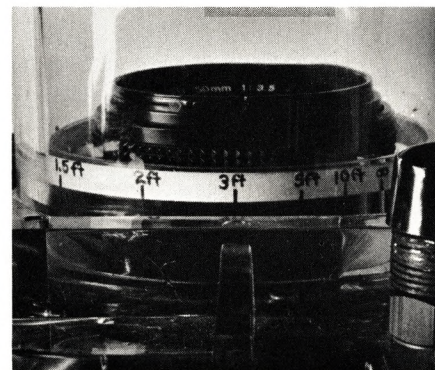
Table 1 shows the actual air distance versus water distance tables I have worked out for the Canon F-1. They are most accurate only for the combination of F-1 and Ikelite dome. Other cameras with different positions within the housing, or with other size domes on other makes of housings may require a different set of figures.

Night Light

This will help you check your camera settings without fumbling around with a separate underwater dive light. Using the battery clip sold by Ikelite for use with bulb-type flash guns, install the battery holder in the front half of the housing. Position a Radio Shack micro-switch so that you turn the light on and off by lifting the shutter release control up to the roof of the housing. The spring loaded switch turns the light off when the control is returned to the camera. The light should not be on during an exposure as it could cause reflections inside the housing which would be picked up on the film. A single AA battery fits



Top: A focusing scale attached to the focusing collar helps to compensate for a 25 per cent difference in apparent film-to-subject distance underwater. Above: To check camera settings in low light or at night, install a small bulb in your housing.



Top: The assembled housing with the focus scale preset at three feet. Note use of the central structural rib as a reference point. Above: Taped to shine on the aperture scale, the night light also will illuminate focus scale.

into the battery clip to power the light bulb. Position the bulb so it shines down over the aperture scale.

These added features will make it

easier to handle and quickly focus your housed camera underwater. Ultimately, easier handling results in fewer missed shots and better photographs. ☺

TABLE 1

Camera to Subject Distances

For Canon F-1 and Ikelite dome port. All distances are measured from the subject to the *film plane* of the camera, not to the front of the lens or front of the dome port.

Camera to subject air focus scale setting and distance	Camera to subject apparent distance UW seen by eye (16" = 1')	Camera to subject measured distance UW in real inches
13-1/2"	8'	10' = 128"
13"	6'	8' = 96"
12-1/2"	4'	5-1/3' = 64"
12-1/8"	3'	4' = 48"
11-7/8"	2-1/2'	3-1/3' = 40"
11-3/8"	2'	2-2/3' = 32"
10-9/16"	1-1/2'	2' = 24"
9-9/16"	1'	1-1/3' = 16"



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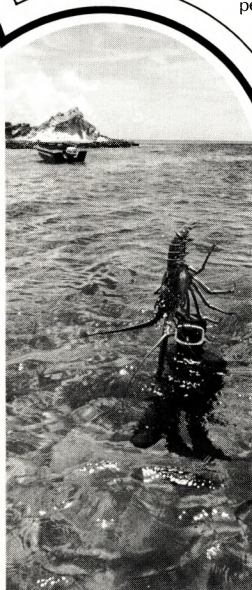
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Caicos Reef Lodge: East Bay Contact: The Manager Phone: 3205	x	x	B	x	—	—	x	40	16
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PINE CAY									
The Meridian Club Contact: Chuck Hesse Phone: 4417	No	x	F	x	x	x	x	30	No
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Provo Turtle Divers Ltd. Package and group rates for Third Turtle Inn Contact: Art Pickering Phone: 4230	x	—	B	x	—	x	x	50	25
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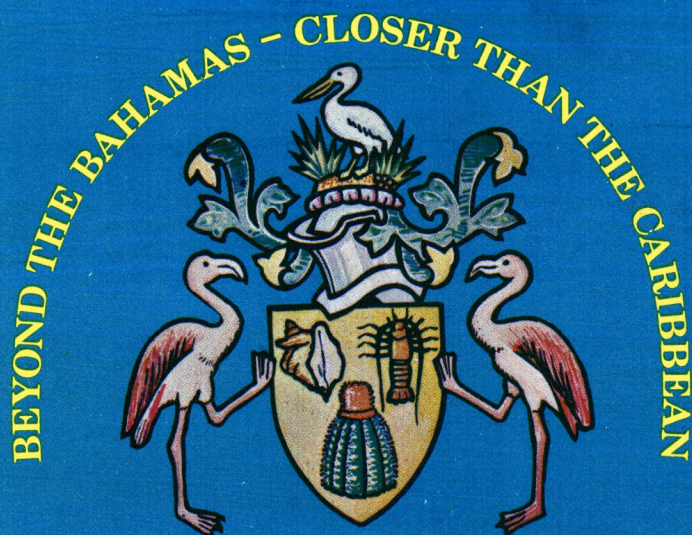
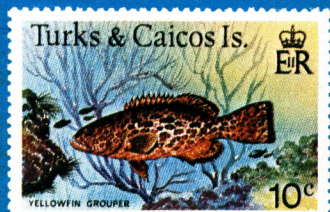
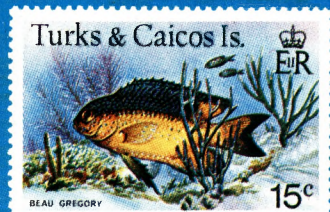
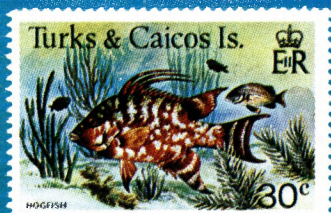
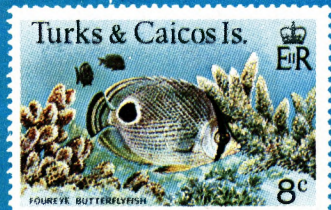
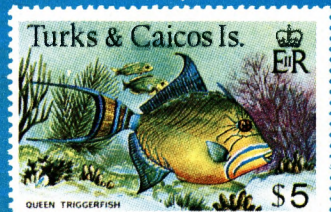
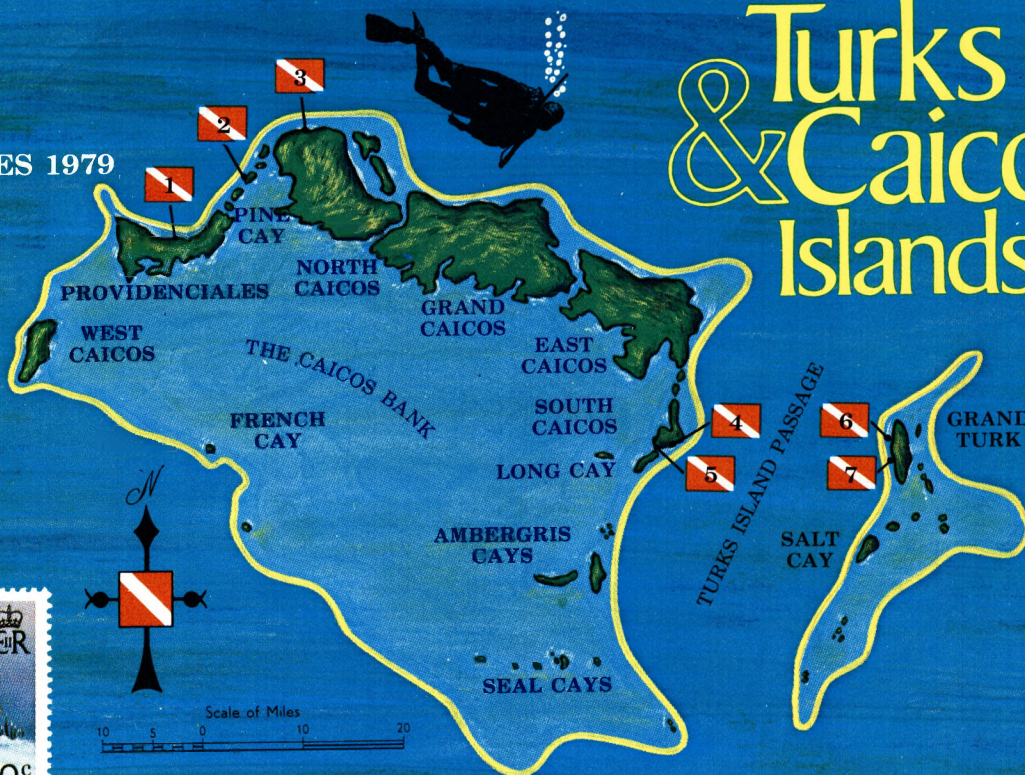
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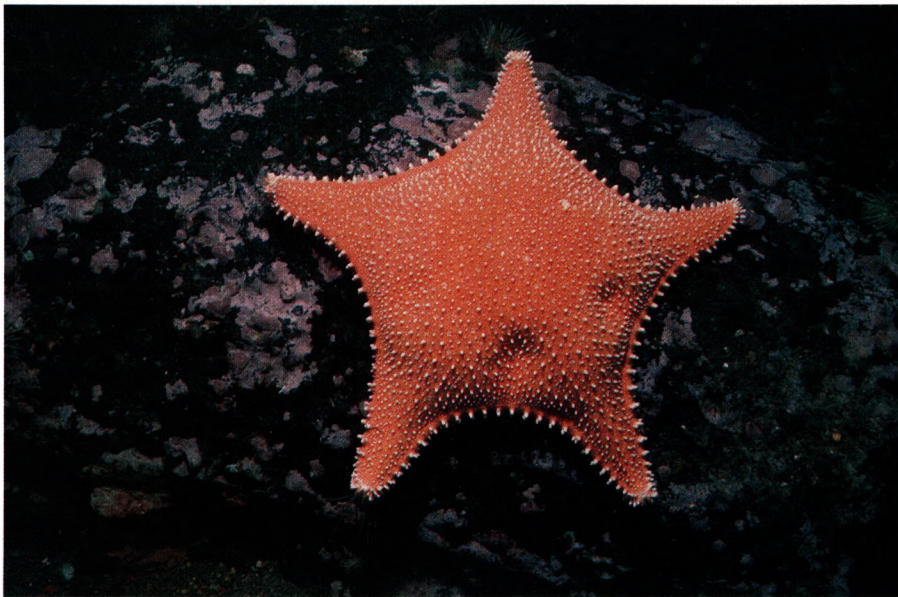


The Living Sea:

Maine's Cold-Water Aquarium

Eastport's unique tidal conditions bring deepwater species to inshore waters.

BY FRED BAVENDAM



Facing page: A hermit crab, *Pagurus acadianus*, poses atop a rock while a red-gilled nudibranch crawls up the side. The hermit crab's shell is covered with a thick growth of snail fur, a parasitic hydroid. Top: Paul Erickson, *Homo sapiens*, of the New England Aquarium, swims along the granite blocks of a ruined pier seeking specimens. Above: This red gold-bordered sea star, *Hippasteria phrygiana*, is usually found near the soft coral on which it feeds. Right: The rare northern basket star, *Gorgonocephalus arcticus*, spreads its tentacles near the Eastport pier to trap bits of food.



The October morning air was clear and cold when we reached the Eastport waterfront. Across the waters of Passamaquoddy Bay lies the Canadian province of New Brunswick. I had come with a collecting crew from Boston's New England Aquarium to shoot underwater movies and stills.

After checking the dive site, we returned to our vehicles to prepare for the dive. The water had risen over four feet.

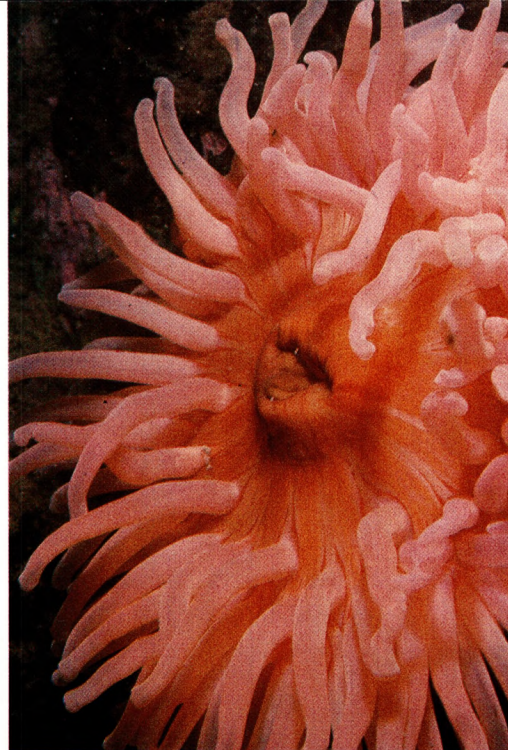
Eastport is a small Maine fishing town on Moose Island, which separates Passamaquoddy Bay from Cobscook Bay. These bays form the Bay of Fundy tidal system, famous for its great tidal fluctuations. Eastport has the greatest tides in the continental United States. They range from weak neap tides of about 11 feet to strong spring tides up to 27 feet. The currents are often several knots and at bottlenecks, like the reversing falls in Cobscook Bay, they reach ten knots at maximum flow.

This tremendous flow continually mixes the water and prevents formation of the shallow water thermocline usually found along the New England coast in the summer. The water temperature barely reaches 50°F. in the summer and drops to 32°F. in the winter.

These unique physical features have spawned marine fauna distinctively different from that of any other area in New England. The Aquarium has devoted a special tank to Eastport's habitat. The absence of a thermocline is the major factor in the development of the unusual marine life.

Fred Bavendam's work has appeared in National Wildlife, Yankee Magazine and Sport Diver. The photographs used here will appear in Beneath Cold Waters, a book to be released this fall by Downeast Enterprises of Camden, Maine.

continued



Above: The tealia anemone, Tealia felina, also called the northern red anemone, reaches a size of eight inches across. Top left: Montague's shrimp, Pandalus montagui, is one of several shrimp sought by New England fishermen. Left: The anemone sea spider, Pycnogonum littorale, punctures the skin of the anemone to suck body juices.

As winter melts into spring along the New England coast, the sun heats the top layer of ocean water. By late summer, the heated layer extends downward 80 to 100 feet. Above the thermocline, temperatures remain in the mid 50s to low 60s, with the few top feet near 70°F. But at the thermocline, the temperature will drop into the low 40s within the space of a few feet. Many marine animals, such as bright red sun stars, pink pandalid shrimp and rosefish cannot tolerate the warmer temperature above the thermocline.

On my first trip to Eastport, I found many of these animals in the cold waters just below low tide. On that trip and later ones, I photographed over two dozen sea creatures I had never seen before, or had found only in areas below the thermocline.

Granite block foundations are all that remain of two piers on the waterfront of downtown Eastport. These blocks have provided the solid substrate for

numerous sea anemones, including the frilled anemone and the northern red anemone. Among clumps of the frilled anemone you can find the maned nudibranch and the anemone sea spider which feeds on this anemone. The blocks are further encrusted with sponges, coralline algae, hydroids and tunicates. Through this crawl limpets, chitons, pandalid shrimp, hermit and rock crabs. Purple sea stars feed on mussels attached to rocks, and these in turn are eaten by red sun stars. Blood stars eat sponges. Red-gilled nudibranchs feed on the hydroids. Little rock eels dart in and out of crevices. Ordinarily fished for at depths below 300 feet, a community of rosefish lives in the blocks. With large nocturnal eyes, they hide deep in the crevices during the day and come out to feed only at night.

Beyond the foundations is a rock and mud bottom with intermittent rocky outcroppings. These outcroppings harbor more anemones, sponges, hydroids

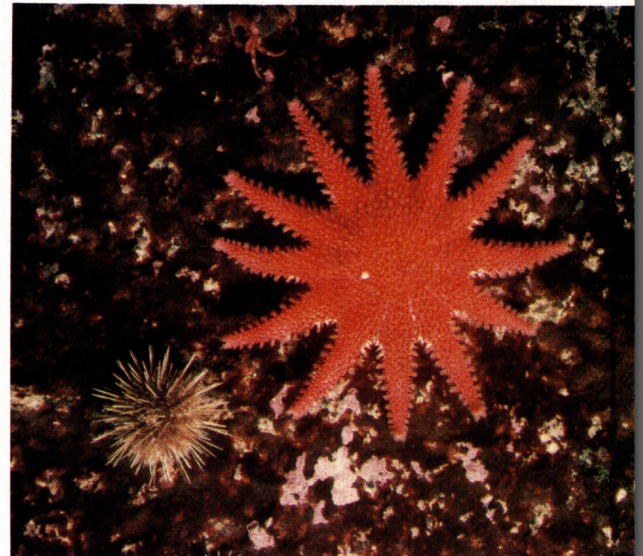
The New England Aquarium

The New England Aquarium, chartered in 1957, functions as a private, non-profit, education and research institution dedicated to "making known the world of water." A multi-million dollar main building features three extensive galleries of living aquatic and marine animals. Inhabitants of the 180,000-gallon "Giant Ocean Tank" include sharks, sea turtles, moray eels, alligator gars, and tropical reef and Gulf Stream game fish.

New England's intertidal and subtidal invertebrate life, including the Eastport inhabitants are being documented, collected and transported to the Aquarium and a multimedia production will highlight these marine species in late 1979.



Left: A rock crab, *Cancer irroratus*, feeds on a green sea urchin. Below left: Eyes of the Icelandic scallop, *Pecten icelandicus*, appear as rows of small dots along the outer edge of the mantle. Below: This spiny sun star, *Crossaster papposus*, feeds on other species of sea stars.



and tunicates. Attached to the smaller pebbles are delicate polyps of branching soft coral. The gold-bordered red sea star feeds on these soft corals. Waved whelks and Stimpson's whelk are also common. Clumps of a calcareous lacework made by colonies of sabellid worms and large sponges resembling loaves of dough abound. The most unusual star of all, the northern basket star, is also found here. Rare in most locations, they are abundant in these waters. Young basket stars are parasitic on the soft coral, but as they mature they spread intricately branched arms into the current.

The fish found in Eastport waters are typical New England species. The bottom dwellers include sculpins, sea ravens, ocean pouts and skates. The longhorn sculpins are numerous and grow from ten to 16 inches in length. The ocean pout is also distinctive. It is a long eel-shaped fish with a pointed face and thick lips, which give it its name. Pouts eat molluscs, crustaceans

and echinoderms. I have also seen flounder, pollack, herring and mackerel near Eastport.

Another attraction for divers is the abundant scallops. Maine law allows a diver to take up to a gallon of scallop meat per day during the season, from November 1 through April 15. Lobster are off limits to Maine divers. Poachers are fined and their dive gear confiscated.

It is important to be aware of the currents when diving the bays. The same currents that bring vast amounts of plankton to the sessile organisms have cut deep channels along their paths. Almost all of these sessile animals are attached to rocks or other solid anchors. Several guidelines for the diver should be noted. Because tidal currents are strongest near the surface and at the center of the channel, it is best to avoid these areas except at slack tide. Use a submersible pressure gauge so you can swim from shore and return along the bottom. If possible, plan trips to coin-

cide with the weaker neap tides at half-moon. You'll encounter less tide, less current and better visibility.

If you're planning a dive in the area, talk to some local divers. Edwin "Butch" Huntley, from nearby Lubec, has been diving Eastport for years. In the past he's acted as a guide for visiting dive groups and chartered out his boat. Another source is the marine library at the *Quoddy Times* newspaper office in Eastport. An area nautical chart is available at Wadsworth's Hardware.

Air stations are limited. McGonigal's Mobil station and the Triangle Store on Route 1, five miles north of Calais, are the closest: 30 miles from Eastport. And bring everything you'll need, the nearest full service dive shop is more than 100 miles south in Bangor, Maine. Although the logistics are a little difficult the reward is great—a chance to explore the world of deep water North Atlantic marine life in relatively shallow and comfortable conditions. ☺

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History:

The First Frogmen

In World War II, the UDTs had no scuba. Instead they were issued helmets and sneakers and told to wade in close to reconnoiter enemy positions.

BY RO SHEFFE



Left: James T. Cahill, former UDT squad leader, now president of New England Divers, was the first to dive with compressed air in New England waters.

RO SHEFFE

Four thousand yards offshore, big Navy guns pounded tons of explosive shells into the shredded beach. Japanese mortars, shells and high velocity machine guns answered, bristling from invisible nests rooted in the dunes barely 50 yards inland. But the U.S. Navy's Fifth Fleet and thousands of crack Japanese Imperial troops that January morning, 1944, weren't concentrating on each other. They were watching a far more amazing spectacle. Something was moving in the murderous fire zone between the warring forces. It was two men in an open rubber boat.

Armed with a seven-inch sheath knife and a stubby pencil, the two men steadily paddled toward shore through the deafening hell of a howling artillery exchange. Shell fragments blackened the air around them. Their wake erupted in tall columns of blasted seawater and bloody fish parts. One of the men sang. The other told him to shut up. They were nearing a line of coral heads 500 yards from shore, they were still alive, and they had a job to do. They shipped

While researching this article, associate editor Ro Sheffe demonstrated almost superhuman fortitude and stamina by resolutely declining repeated invitations to sign up for a UDT training program.

oars and slipped over the boat's side.

Two hours later, two exhausted men in green swim trunks stood dripping on the deck of Vice Admiral Turner's flagship wardroom three miles off Kwajalein Island in the North Pacific. From sketchy notes scribbled in a shaky hand on small plexiglass slates, the men described Kwajalein's reefs, approach depths and slope, coral heads and enemy obstructions. The admiral listened closely. Two months earlier, 3000 Marines had been massacred when assault vessels foundered on shallow reefs and submerged steel barriers surrounding Tarawa Atoll. Stranded in open landing craft in shoulder-deep water, the men presented easy targets for Japanese shore batteries.

Because these two men standing before him had disobeyed orders, leaving the dubious security of their rubber boat to dive among coral heads and hostile gunfire, Tarawa's carnage was not repeated at Kwajalein. The men were chewed out, awarded medals and given a shot of brandy. War correspondents and the world were given a new acronym: UDT.

The initials stand for Underwater Demolition Team, known to generations of moviegoers as the frogmen of wartime newsreel fame. At first they

didn't much resemble divers, because they weren't. Trained to wade, not swim, and forbidden out of their inflatable boats without lifelines, the first frogmen wore steel helmets, fatigues, Mae West lifejackets and boondocker boots. Swim fins had been tried and rejected as "unsuited to military use." The primitive gear served because it had to, and it wasn't until the two men at Kwajalein stripped to their swim trunks to carry out their impossible assignment that the first major departure in UDT tactics began to evolve. The unquestionable value of pre-assault reconnaissance had been proven, and now the UDT was given a new mission objective. The men who were already being described by unbelieving Navy brass as "half fish and half nuts" were to swim practically naked into the enemy surf line in broad daylight, directly under the muzzles of deadly accurate Japanese gunners, to locate, chart and destroy thousands of tons of coral and massive concrete and steel barriers ringing the heavily defended beachheads. These were the guys sent in even before the Marines. In fact, the first boatload of Marines to wade ashore during the bloody assault at Guam found a holed and shrapnel-chipped four by five-foot sign still standing erect in the surf. It

continued



Left: UDT team skipper Jim Cahill, left center background in hood, suiting up for a mile swim among the icebergs in 28-degree water off Thule, Greenland, August 4, 1951. This was the first cold-water test of scuba gear and the new "dry" suit.

read: "Welcome, Marines. Beach open courtesy UDT-4. U.S.O. two blocks."

"Extra hazardous duty" this was called, and volunteers were needed. The call went out for "strong men in good health, aged 20 to 35, with no fear of explosives." Response was so great a torturous training program was devised to weed out the men from the supermen; less than 40 per cent of the volunteers made it through the first bruising week of training. Of those who completed the ordeal, many belonged in hospitals with minor injuries by the end of the program. The men who emerged were ready for anything, and those who had to ask were told UDT meant "unusually damn tough." Standard combat dress had changed too, but snide comments about UDT's new baby blue sneakers were kept well out of earshot of the men who wore them.

Besides the camouflaged canvas coral shoes, the new UDT wore little else. Painted blue with theatrical make-up, the men wore blue boxer trunks, kneepads, canvas gloves, hard round masks with brittle glass faceplates and steel helmets. Horizontal black stripes one foot apart were painted on the men from toe to chin for hasty depth estimates. They dangled reels of line, balsa buoys, plastic slates and as many 20-

pound canvas packs of volatile tetrytol explosives as they could carry. Two enlarged 70-man teams were given 20 minutes to affix 20 tons of explosives to the concrete and steel barriers, tie it all together with waterproof fuse, mark the cleared channels with buoys and swim half a mile or more back to fast pickup boats before they were blasted out of the water by their own charge. If they made it that far, they'd have to dodge sensitive mines, thick curtains of shrapnel and point blank machine gun strafing while fighting crashing surf, rapidly changing tides and murderous rip currents among the fringing reefs. The fact that almost half of these men survived was a tribute more to the unbelievable determination of individuals under hellish stress than to any amount of combat training they could receive.

By the latter part of 1944, both the audacious heroics and the awful casualty rate of the demolitioners was legendary. Less than a year after the first UDT combat swim took place at Kwajalein, 60 per cent of the elite force was dead or disabled. More men were needed. A young, newly commissioned ensign from Massachusetts volunteered and was whisked to Camp Perry, Virginia, where a new training program was about to begin. The camp bustled with

boisterous Army, Navy and Marine volunteers loudly trying to hide their nervousness, but within hours Ensign James Cahill had more sober thoughts on his mind. Rumors had made their inevitable way into the supposedly secret group. It was being said that Navy intelligence assumed a shocking 75 per cent casualty rate for future UDT missions. Though the story was false, it had a galvanic effect. Before bed that first night the men were told they were about to experience hell. They were also told they could quit at any time simply by raising a hand. Many hands showed. Cahill's wasn't among them.

Although there were times during the next 16 weeks when two-mile swims and hours of calisthenics drained him of enough strength to drag his hand above his head, Cahill's bruised body was one of 65 left standing by the end of climactic and appropriately named Hell Week. More than 100 had quit or been carried away on stretchers. Usually a prolific journal-keeper, Cahill that last night managed only a terse line in shaky script: "Our team came in first. Dead tired. Good night."

UDT-2 was Cahill's new assignment. The gear lockers now bulged with new, top secret equipment added by UDT-2 skipper John Koehler after the Kwajalein assault. At Kwajalein, only a few men had used facemasks and goggles. Immediately afterward, an urgent radio dispatch was sent to a sporting goods manufacturer appropriating his entire stock of green rubber masks. Triangular swim fins of hard, black rubber were issued. Sporting goods stores in Hawaii, Pacific headquarters for UDT-2, were looted for all the light canvas sneakers that could be bought or traded. The men now wore prototype waterproof watches and compasses. But the most bizarre device of all was still under wraps, an ultra secret piece of equipment judged too hazardous for use by the UDT until six years later in Korea. Named after the French inventor who had secretly labored



Left: Two generations of divers: Jim Cahill assists son and business associate Mike back aboard the Bob-Sea, Cahill's 28-foot custom tug, after a lobster foray near Cat Island off Marblehead, Massachusetts. Net: 13 legal bugs in just under 40 minutes.

to assemble it during the German occupation, the device was known only as "the Cousteau." It was a tank of compressed air. With Cousteau's demand regulator, men could breathe from it while underwater. The face of underwater warfare was changing.

The idea of using underwater swimmers for military missions wasn't new. Italian underwater guerrillas known as limpeteers had been using small rebreathing systems since 1941. Riding two-man barrel shaped submersibles called pigs, the limpeteers slowly motored beneath the keels of Allied ships to attach time delayed mines to the hull. The U.S. Navy had experimented with oxygen rebreathing devices since 1927. And as early as the 15th century Leonardo da Vinci had designed an underwater breathing device for Venetian swimmers protecting Italian harbors against hostile Turks.

But the Momsen Lung, a contemporary incarnation of Leonardo's device, proved useful only for rescue operations; the non-compressed air in the Momsen breathing bag could get an airless swimmer to the surface, but many died using it to descend. The Lambertson Lung, an oxygen rebreathing system, also was plagued with risky and unpredictable hazards. Wearing it,

a diver breathes air endlessly recirculated through a soda lime filter to extract carbon dioxide. Oxygen injected at irregular intervals by the diver keeps the spent air breathable. But too little oxygen caused unconsciousness; too much caused convulsions and death from oxygen poisoning. Worst of all, the smallest leak in the soda lime canister meant instant death as salt water reacted with the lime to produce a deadly gas. In those early days of hesitant exploration, little was known of hyperbaric effects, and Cahill remembers his instruction as rudimentary at best: "Don't go below 33 feet; and when you get a little woozy, give yourself a shot of oxygen."

It was understandable, then, that when the first successful UDT dive using compressed air was gingerly carried out on the evening of October 13, 1950, the Navy quickly realized the strategic value of the new device and hurriedly introduced the aqualung, as it was then called, into rapidly changing UDT training programs. The new gear greatly extended bottom time, although no one yet knew how much, and permitted far greater operating depths, though accurate limits weren't known either. Decompression times were hit or miss guesswork, and the pitching deck of a warship was the closest thing to a recompression chamber for many a bent diver. Still, occasional embolism was preferable to the more frequent and agonizing casualties from rebreather oxygen poisoning, and within two months heavy steel tanks with stiff rubber hoses were pumped and packed off to UDT teams around the world for testing and evaluation.

Christmas Eve, 1950, found a glum Lieutenant Jim Cahill steaming the North Pacific, three days outward bound from his wife and facing a 17-day passage to join UDT-2 off the Korean coast. The cold war had ignited, and Cahill once again was a frogman.

True to Navy tradition, no sooner

had the transport dropped the hook off Korea than new walking papers were cut; destination: Thule, Greenland, 700 miles north of the Arctic Circle, by way of the Virgin Islands. After a brief indoctrination in the use of sophisticated new scuba gear in balmy St. Thomas, Cahill's team steamed for arctic waters on a dual mission: iceberg demolition and the first cold water testing of "the Cousteau." They were also to test an even newer piece of gear, a rubberized exposure suit. The recently developed neoprene coverall was called a drysuit. It wasn't.

An overcast day in August was chosen for the first test. Air temperature had climbed to 30°F. The slushy water checked in at a brisk 28°, just at the freezing point of seawater. Seven divers were to swim a measured mile wearing rear-entry suits of stiff, one-piece neoprene. Rigid regulation Churchill masks were used; heavy, absolutely cylindrical monstrosities that leaked floods until the wearer carefully carved the thick rubber to conform to facial curves. Wool socks and triangular, open heel fins completed the outfit. Heavy steel clamps drew closed like sphincters the puckered entry vents between the suits' shoulders and seven divers hit the slush.

Some of the suits developed small leaks immediately. Others, large ones. Three never made it, pulled numb from the water after long minutes freezing in a fast filling suit. All seven suits leaked, but Cahill and three others quickly found swimming positions that minimized the intake. Others were hopeless, sucking water at the wrists, ankles and neck so fast the numbed wearers nearly sank out of control. One had sleeves so short they prevented any swimming stroke.

Just under an hour later, four dazed divers crawled near paralyzed from the surf. One couldn't walk for hours. Two others recovered no feeling in their hands and feet for days. Cahill lost his breakfast and replaced it with a shot of brandy.

continued

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But why the punishing push to finish what should have been an aborted attempt? What was the point in enduring an hour's agony when the first minute demonstrated the obvious need for patchwork? Standing in the wheelhouse of Cahill's custom tug, I wanted to ask, then thought better of it, suspecting the answer was found in Cahill's reply to an earlier question.

"Do you miss the UDT?" I'd asked the man who left the Navy to introduce compressed air diving to New England.

The man who had gone on to build one of the nation's largest international dive shop equipment export facilities thought the question over. Even as a civilian, he'd been the first diver called at three a.m. years later the night a prototype offshore surveillance rig collapsed in high seas, coming to rest with all hands in 190 feet of water.

The man who was the first to breathe from a compressed air tank in New England waters grew quietly serious. The ever-present squinting smile left the face of the man who had introduced diving to Olympic champ Buster Crabbe; to Robert Shourot, president of Coastal Diving Academy and Undersea Systems, the nuke diving outfit; to *Skin Diver* magazine publisher Paul Tzimoulis; to Parkway/Posiedon president Frank Sanger, the double amputee who became one of New England's most proficient salvage divers, and to thousands of others in the past 27 years.

"Damn right. Yes. Of course I miss it. I couldn't say exactly why. A lot of reasons. The teamwork, the self reliance. UDT just stays with you; it's something you never lose. Ask any of them," he said.

The rugged face softened a bit, the smile returned; 30 years and as many excess pounds seemed to melt away and I was again looking at the lean, determined face of the young lieutenant who'd once accepted a Marine's challenge to see who could dive over the highest pile of furniture a zealous UDT team could pile in the lobby of the St. Thomas Hilton. Dozens of minor surgical excisions of sun-induced skin cancers had left barely perceptible marks on his cheeks, and after a welter of punctured eardrums his hearing wasn't what it used to be, but Cahill was right. UDT still showed. He chuckled.

"Sure, I'd do it again, all of it. But if I ever thought I'd live this long, I sure as hell would've taken better care of myself."

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Photo by Dick Harrison

The Defence: An American Privateer

Scuttled in action near Castine, Maine, the excavation of this Revolutionary War brig has revealed little-known facts about life aboard colonial American naval vessels.

BY JONATHAN A. BLUMENFELD
AND DAVID C. SWITZER

It was August 13, 1779, and the largest American fleet assembled during the Revolutionary War was in disorganized retreat, fleeing the British squadron sent to break the siege of Majabagaduce—present-day Castine, Maine. The American forces, consisting of six naval vessels, 13 privateers, and 20 transport and provision vessels, were annihilated. Of the original 39 ships, all except two were scuttled by their crews. The financial loss to the State of Massachusetts amounted to some eight million dollars in modern currency. The loss in morale was such that General Washington, when approached with plans some months later to retake the peninsula, would not even consider mounting another major campaign in the area. Captain Dudley Saltonstall, commander of the American naval forces for the Majabagaduce campaign, was subsequently court-martialed and cashiered.

In spite of the panic during the rout, some American captains bore their commands well. As the rest of the fleet fled up the Penobscot River, Captain John Edmonds of the Massachusetts privateer *Defence* took a different course. Breaking off from the fleet, Edmonds headed for Stockton Harbor, an inlet west of the river mouth. There, anchored in the lee of Sims Island, he waited for nightfall to make good his escape.

The escape was never attempted. Sir George Collier, commodore of the

Jonathan Blumenfeld received his M.A. in Archaeology from the University of Colorado and served as a supervisor for the Defence excavation. Dr. David Switzer is director of the Defence project.



British fleet, observed the *Defence* as she slipped into hidden anchorage. He directed Captain Collins of HMS *Camilla* into the inlet to take or destroy the *Defence*. The orders were never carried out. At midnight the brig, armed with 16 six-pounders, was set afire by her crew. An explosion shattered the *Defence*, hurling burning debris hundreds of feet. By dawn the vessel had settled to the bottom of Stockton Harbor, her masts still visible above the water.

No record has been located regarding British attempts to salvage the *Defence*, although such attempts were almost certainly made. Residents of the surrounding area probably looted the wreck, for iron, cordage, and other manufactured goods were scarce in this agricultural backwater. Harsh Maine winters and torrid summers finished what the American sailors had begun. In time the masts snapped and the vessel settled into the mud, remembered only through local lore and scattered written accounts of the disaster.

In 1972, the Maine Maritime Academy hosted a Sea Grant-funded laboratory in ocean engineering. Among the projects scheduled for the summer was the construction of a side-scan sonar, used to locate irregularities on the seabed. Dean Mayhew, professor of history at Maine Maritime Academy, persuaded Captain William Searle, USN (Ret.), director of the laboratory, to test the equipment in Stockton Harbor. Professor Mayhew's research in British Admiralty records indicated the *Defence* might be found there. The sonar revealed a small anomaly projecting above the seabed near Sears Island.

Investigation by divers confirmed the existence of a wreck. Over the next two years a preliminary excavation directed by Captain Searle, assisted by Maine Maritime Academy Professor David Wyman, led to a tentative site plan, which recorded the location of all artifacts recovered from the wreck site. Several unique finds, including a cannon cast in Massachusetts in 1778, con-

continued

vinced the Maine State Museum of the archaeological importance of the site. A comprehensive excavation plan involving the Maine State Museum, the Maine Maritime Academy and the Institute of Nautical Archaeology (presently affiliated with Texas A & M University), was drawn up. Work on the site commenced during the summer of 1975.

Dr. David Switzer, adjunct professor of the Institute of Nautical Archaeology and a professor of history at Plymouth State College in New Hampshire, was chosen to head the excavation. His expertise in American history combined with underwater field experience in both Turkey and Scotland complemented the skills of David Wyman. Wyman's knowledge of naval architecture proved invaluable in the painstaking work of reconstructing the *Defence*. Responsible for producing accurate plans of the vessel, Wyman's work also enabled the location of structural members and artifacts to be recorded with an accuracy exceeding one centimeter in both horizontal and vertical dimensions. The accuracy of the excavation was ensured by the use of student archaeologists as divers. Their diverse skills aided in the design and construction of specialized equipment for the underwater research.

Four airlifts in 20 and 40 foot lengths were made to compensate for the severe tidal fluctuations in Stockton Harbor. PVC grids divided into five-foot squares were used to record the provenance of all recovered finds. An underwater video camera, on loan from the Maine Department of Transportation, was used to make a permanent record of the excavation. Floating sieve boxes stable enough to support the weight of an archaeologist, yet fine enough to recover items as small as brass pins, were constructed to safeguard against the potential loss of minute artifacts. Hookah systems, reliable and powerful enough to support four divers indefinitely at depth, were rigged to extend working time otherwise limited by the amount of bottled air available. An on-site conservation system and the constant presence of a conservator from the Maine State Museum laboratory ensured that the initial care given recovered artifacts was the best available.

Novel conservation problems re-

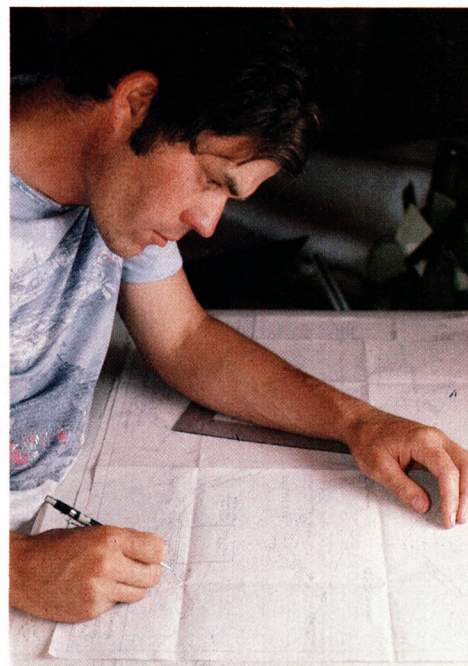
quired novel solutions. Fragile organic artifacts such as colonial shoes and gun wadding were carefully sewn up in nylon netting to prevent the deterioration that can occur through even slight motion in the holding tank. A fragile boxwood Gunter's scale—used to solve navigational time, speed and distance problems—was immobilized between plexiglas sheets to prevent the warping common to thin wood removed from a stable marine environment. Black powder grenades were stored in double water-insulated Nalgene containers; even after two centuries of submersion



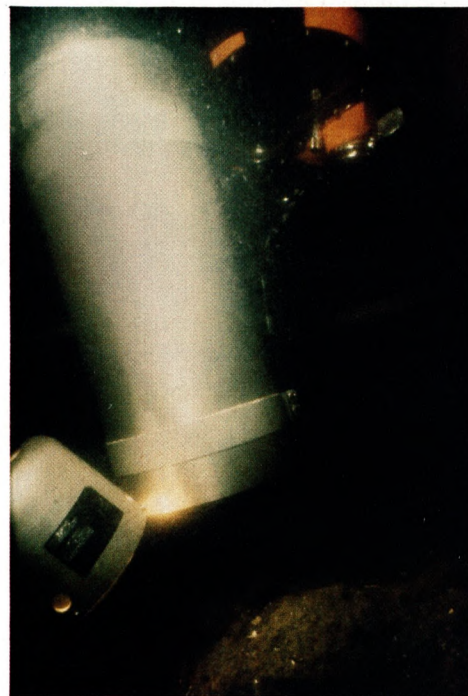
they retained a lethal explosive potential. Wooden mess kids and drinking firkins still wrapped with original withy, or split-branch binding, were placed in separate holding tanks and hand-carried to conservation facilities.

The simplest finds often revealed the most about shipboard life. Crude wooden trenchers and stoneware mugs, the property of crew members, testified to the dreams of men who hoped to become wealthy through the capture of an under-manned merchantman. Several ornate French bronze buckles indicated the presence of wealthier men, probably officers. Flat pewter buttons bearing the legend "USA" were recovered from two different areas of the ship. They may have belonged to a Continental Army deserter who joined the privateer in the hope of quick fortune. A sailor's palm, still pliable after two centuries of submersion, indicated that the man responsible for maintaining the ship's sails was left handed.

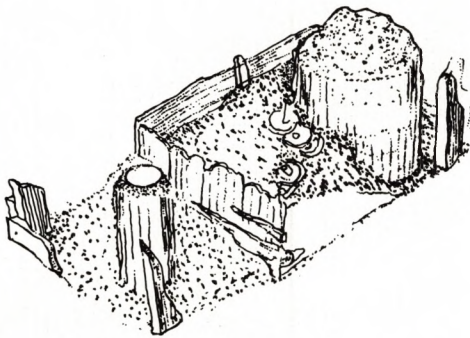
No less interesting than the personal finds were artifacts connected with the



*Above: Naval architect David Wyman works on the reconstruction of the vessel. Left: Deadeyes formed part of the standing rigging used to support the *Defence's* masts. Below: Underwater video cameras helped record the progress of the *Defence* excavation.*



business of privateering, an occupation but one step removed from piracy. Hundreds of stands of grapeshot, linen bags filled with iron and lead shot packed around ash spindles with oak bases, were recovered. These projectiles, used as anti-personnel weapons during close-quarters combat, turned each of



Above: Artist's rendering of the mainmast, shot bin and bilge pump assemblage. Right: Grapeshot was the most devastating anti-personnel weapon on the *Defence*. Below: Shot garland being cleaned by a museum conservator minutes after recovery. Bottom: Shot garland in situ prior to recovery.



the brig's cannon into an enormous shot-gun capable of single-handedly clearing the decks of a small enemy vessel. Bar shot, used primarily in the destruction of masts and rigging, was also recovered, as was round shot, used to hole an enemy vessel below the waterline to sink her.

Crude but effective wooden implements were used to service the privateer's six-pounders. Thick oak handspikes, some still showing the marks of the drawknives used to finish them, often bore graffiti attesting to the idle hours of gun crews. Three-piece wooden swabs, used to extinguish smoldering debris remaining in the cannon after firing, retained the marks of the drawstring used to fasten the sheepskin to the end. A linstock, split at the top to receive the slowmatch, still showed the irregularities of the branch from which it had been shaped.



Most naval actions of the period were ultimately decided by hand-to-hand combat after boarding. Partly for this reason the *Defence*, less than 100 feet in length, had a signed complement of nearly 100 men. Eager to privateer, men could be signed on for little more than the promise of a share in a successful cruise. Thinned out through disease, combat, desertion and crewing aboard prizes, an original crew of 100 might prove to be insufficient for an extended voyage. Often carrying a motley array of personal weapons, American crews had a reputation for courage and ferocity that caused many British merchantmen to strike rather than engage an American privateer in a fruitless and bloody action. Unlike English sailors, many Americans were crack shots, having subsisted through hunting in a country where powder and shot were often scarce.

Small lead balls, ranging in size from approximately .32 to .48 caliber, show that several of the *Defence's* crew may have been armed with specialized

American rifles, developed on the Pennsylvania frontier after the model of the earlier German *Jaeger* rifles. These weapons, having pinpoint accuracy exceeding 150 yards, were the terror of the British, whose own riflemen were generally inferior to the Americans. Musket balls of .66, .67 and .68 caliber testify to the presence of .69-caliber French Charleville muskets on the privateer. The Charleville was the most popular standard long arm used by the Americans during the Revolution. That British .75-caliber "Brown Bess" muskets were used on the *Defence* is indicated by the recovery of dozens of .72-, .73- and .74-caliber lead musket balls. These heavy and inaccurate muskets, though inferior to the French Charleville, were still used by many Americans, who had kept them after serving in the French and Indian War. Several finely-knapped gunflints, of both English and French origin, were found in the midship area and, on the basis of size, were assigned to American, English or French arms.

The identification and conservation of artifacts from the *Defence*, though difficult and time-consuming, represents only the initial step in the interpretation of a unique archaeological site. Historical documentation, an often dubious form of information, must be studied and restudied in light of the possible prejudices of both readers and authors. Conflicting evidence must be discarded, often with misgivings attendant upon the knowledge that, in slightly differing circumstances, such information might have been incorporated into a final report.

Sherlock Holmes once said that when the impossible is eliminated what is left, however improbable, must be true. In rediscovering the past, an archaeologist deals with a history that, by its very nature, is constantly being rewritten.

The *Defence* excavation, like many projects of the Institute of Nautical Archaeology, is supported entirely by contributions from institutions and private individuals. A short professional field season is planned for summer, 1979. Contributions or loans of equipment would be most helpful. Contact: David C. Switzer, Dept. of Social Science, Plymouth State College, Plymouth, NH 13264.

Palau

One of the last virgin coral paradises, Palau has survived a war and a proposed superport, but insensitive divers and overfishing still threaten the reefs.

BY KEN BROWER

PHOTOGRAPHY BY DOUGLAS FAULKNER

A Palauan cock crows, and Douglas Faulkner wakes. He tosses off his single sheet. Here in the Palau Archipelago of Micronesia, seven degrees north of the equator, nights are humid and a sheet is all that's necessary. The plywood walls are spartan, in the manner of most Palau Island dwellings. Interiors hold little appeal when the outdoors are so lovely. Only dive gear and camera equipment decorate the two small rooms. Faulkner pulls on a pair of trunks. This is his uniform in the islands. Picking up his crash helmet, he strides out the door, scattering the chickens scratching in the red volcanic earth outside. Astride his motorbike, Faulkner fastens his chinstrap, kicks the starter and putts off slowly down the rutted road toward the water.

If Douglas Faulkner is the world's photographer-laureate of coral, as many feel he is, then his muses have been the barrier, patch and fringing reefs of Palau. Palau's great appeal is its variety.

An environmentalist and author, Ken Brower's work has appeared in many periodicals including Atlantic Monthly, Audubon and Omni. His book With Their Islands Around Them describes his experiences in Palau. Photographer Doug Faulkner's images have appeared in National Geographic, Life, Smithsonian, Reader's Digest, the Encyclopedia Britannica, Oceans and other journals and periodicals. His books This Living Reef and Living Corals (to be issued fall 1979) contain many photographs of Palau.

The many islands make up a whole world, yet are jammed into a chain less than one hundred miles long. The archipelago's richness, both marine and terrestrial, is unmatched anywhere in Micronesia. Its corals are unmatched anywhere. Faulkner has traveled the world in search of polyps. Nowhere else has he found them in such diversity.

There is something about the green of these islands, about the clarity of their waters, the riot of coralline colors beneath; or is it the dark beauty of the people, the wistful, haunting songs the women sing, that evokes strong loyalty in the travelers who have lived here, disturbing their dreams after they've moved on. Faulkner's loyalty is among the fiercest. The Palaus are the islands that made him, for much of the work that supports his reputation was shot on these reefs. He is grateful. He insists on calling the archipelago by its proper name, *Belau*. ("Palau" is a corruption coined by visiting sailors.) For years, Faulkner's passion for the islands was proprietary. He kept secret many of his favorite places there. Recently he has begun to relent.

The bike passes two stone lions that once guarded a building during the Japanese occupation of Palau. The building is long gone, destroyed in the war. The lions now guard only its memory. The bike passes a stone pagoda that once housed a lantern marking the entrance to a temple. The temple, too, is gone. Monuments to the war are scattered everywhere in Palau, crumbling



Above: An aerial view of Koror, the district center of Palau, shows its western neighbors: Bedulyaus on the right and Ngerkebsang on the left. Looking due east across Koror's West Lagoon, Koror Island appears in the center of the photograph, between Bedulyaus and Ngerkebsang.



in the tropical rain, overgrown by jungle—old walls sagging, stairways leading nowhere, giant coastal cannons billowing ferns instead of gunsmoke. At the Palau Legislature building, a more intact vestige of the war, the road forks. Faulkner turns left and heads uphill to my place.

This morning I, too, have kicked off my single sheet. My plywood walls, too, are spartan. The only decoration is last year's calendar and the bug-eyed geckoes still stalking the walls after last night's moth hunting. The windows have no glass, just wire screens. Over the kitchen sink is a splintered hole where, five years before, a former

room-mate and I fired spearguns at the big tropical rat that visited nightly. This morning I've breakfasted on leftover rice while waiting for Faulkner.

We first met in Palau in 1971. It was Faulkner who introduced me to Palauan reefs, but only, I suspect, because I am a writer and not a photographer. I could take his secret places away with me only on the emulsion of my mind, not on the high-resolution sort he uses.

I climb on the bike behind him and we bump off down the hill. Opposite the Palau Legislature at the bottom of the hill is another old Japanese building. This one now serves as a market. Women

from outlying villages come here each morning to sell produce. By eight, the place has filled with middle-aged matrons and the guttural, polysyllabic babble of their conversation. Some of the older women have arms tattooed black in the old style. A dollar in this market will buy a bag lunch—big slabs of fish with rice, taro and cassava rolled into translucent yellow sausages wrapped in banana leaf, then bound with sennit, a string-like grass fiber.

But today we're up too early for the market, and we buy at the Fisheries Cooperative, where Faulkner gets his air. I get a small octopus laid on a cold bed of rice. Doug gets a fish, laid on the

continued

Right: This chalice coral fringing reef in Macharchar Lagoon, photographed during a rare spring tide, shows the exposed polyps in a fragile rim light.

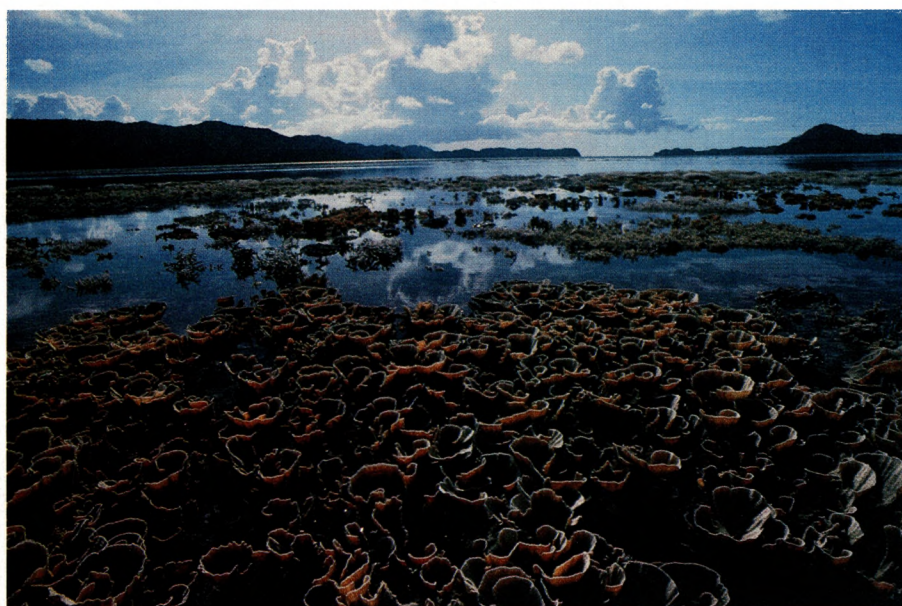
Lower Right: These freckled groupers, *Epinephelus coatesi*, have the ability to adapt protective colorations like chameleons.

same cold, sticky Japanese-style rice. Lunches here are less hearty, but the cool, cavelike Cooperative is a good place to linger for a moment, a refuge from the morning's mounting heat. Buy a Coke. Look at the darkskinned girl behind the counter. The floors are cool from frequent hoseings, the room quiet except for the faint rustling of mangrove crabs in large tubs. The crabs are big, dense, iron colored; their heavy claws bound fast against their bodies with sennit.

We push off in Faulkner's Boston Whaler and head south. Along the shore grow patches of mangroves where the Cooperative's big trussed crabs once foraged. Several miles to the north, on the big island of Babeldaob, are larger expanses of mangroves. Actual rivers wind through the Babeldaob mangroves, emptying into the lagoon. The water is tea-colored, and the mangrove roots wear white sleeves of sediment up to the high-tide line.

Palauan women gather clams among these mangroves, groping the bottom sediment with their feet, picking clams with their toes. It's a muddy chore, and to save their clothes the women work naked. Predictably, peeping-Tomism is an ancient, semi-honorable Palauan tradition. An old joke in Palau, probably the oldest, is to yell "Ius!" and watch the muddy girls and women scramble out of the river. *Ius* is Palauan for "crocodile." *Crocodylus porosus*, the seagoing or estuarine crocodile, is native to Palau, and concentrations are heaviest in the mangrove rivers.

Fourteen years ago, in the channel between Babeldaob and Koror Islands, two Palauan men were nightfishing from a bamboo raft. One man stood in the raft, watching his partner's progress as his flashlight gleamed below. Suddenly the light waved wildly about, then moved off very rapidly in a straight line. Twenty yards from the raft, the diver

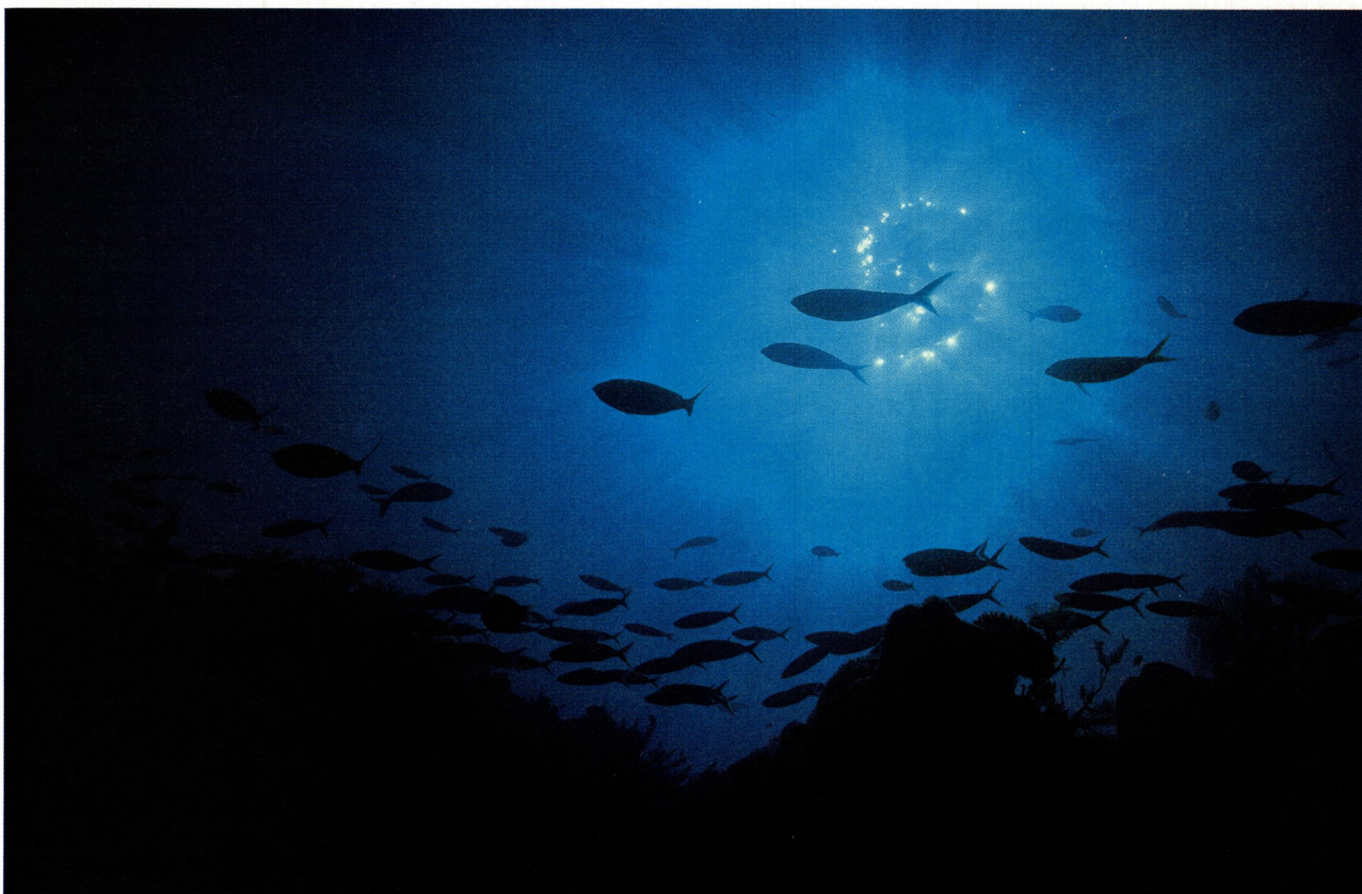


broke the surface, unconscious or dead, held tight in the jaws of a 12-foot crocodile. A police boat later found the diver's remains. Vengeful Palauans, understandably angry, captured and poisoned the homicidal croc, and in all the years since there have been no serious incidents.

Faulkner steers us across Ngerderak Lagoon. Dugongs sometimes gather here—great, shy, vegetarian sea cows that dive at the sound of an outboard.

They are shy for a good reason. In Palau, dugongs are regarded as a delicacy. In the old days, Palauan royalty wore dugong vertebrae as bracelets. These are still seen occasionally, permanent fixtures on the wrists of men who slipped them on in boyhood and are now unable to take them off.

Across the lagoon, we reach Urukthapel Island (Faulkner would insist on "Ngeruktabel"). This is the largest of the islands the Palauans call *elabaob*.



These limestone islands, fossil reefs up-raised high above sea level in Tertiary times, are Palau's geological distinction. Nowhere else in the world do they occur in such size and number. They are steep, rising nearly vertically from the lagoon. Some are nearly 500 feet high. All are choked with dense jungle. There are hundreds of them, all very similar in shape, and they form a maze difficult to navigate.

Hidden in valleys on these islands

are a number of placid marine lakes. Connected by subterranean passages to the lagoon, the lakes rise and fall with the ocean tides. Each lake is unique; many are dominated by a single marine species. One, Medusa Lake, is populated almost entirely by jellyfish medusae. A second is full of snappers. A third is a kingdom of date mussels, its limestone walls a honeycomb of mussel holes.

Some of these lakes are easily ac-

continued

Top left: A juvenile chambered nautilus, Nautilus pompilius, off Bailechesengel Island. Top right: This peacock lionfish, Pterois volitans, emerges for a nocturnal hunt in South Lagoon. Above: Fusiliers, Caesio lunaris, in silhouette.





Facing page: This candy cane sea star, Nardoa novaecaledoniae, feeds on coral polyps. Left: Two of a large colony of batfish, Platax teira, which inhabit a wreck off Ngeruktabel Island.

week it will be something else, and next month something else again. This reef is inexhaustible.

He'd like to see it stay that way. But last year an Iranian-American group announced their intent to build an enormous oil transshipment facility in Palau, and Faulkner was in the forefront of the resistance. The superport would require extensive dredging of the lagoon; this stress and the almost inevitable small, chronic leaks of oil, even if a major spill never occurred, would be disastrous for the island's vulnerable coral population. Through the efforts of Faulkner and other concerned opponents of the idea, the port plans have been shelved for the moment. But there are other kinds of stress which could prove just as harmful.

The aqualung has not been good to Palau. Black coral and giant clams have entirely disappeared from many areas of the reef. Native divers in scuba gear are hunting passes where giant grouper spawn, killing the great fish during breeding season—a departure from the old hunting code in the islands where conservation laws once were strong. Souvenir-collecting visiting divers compound the problem. The highest human use of this reef, after subsistence fishing by the native islanders, is aesthetic, and divers who come only to look are in the best position to enjoy the reef's beauty. From Stone Age times, the reef has been the most important resource in all of Oceania. It can continue to be, even in these more complex times. If the divers who visit here treat the reef gently, they can give it a new economic purpose for being—a cross-purpose to that of commercial exploiters such as the oil industry—and can ensure that the reef's wonders remain inexhaustible. ☺

cessible. Medusa Lake, for example, is just a 20-minute walk from the lagoon. Others are more difficult to reach. A few, deep in the jungle interiors of the islands, may never have been explored. It is still possible to play Balboa to your own miniature Pacifics there.

This morning we are bound for one of the southernmost islands. There is a lot of incidental diving to be done in Palau—marine lakes, limestone caves that drip stalactites, sunken Japanese planes—but the transcendent feature here is the reef. Palau exhibits nearly all possible reef configurations: the barrier reef flats west of Ulong Island, acres of staghorn coral, the flats of Udel and its pastures of algae, Ulach Pass at Kayangel Island which is slowly sealing itself as giant *Porites* coral heads from one side have grown to within 15 feet of those on the other. The archipelago is a showplace for the myriad ways that Indo-Pacific reef creatures can arrange themselves. Half the organisms

here, according to some estimates, are unknown to science.

Here the reef wall begins not 40, or 60 or 100 feet down, as it does nearly everywhere else in the sea—it begins right at the surface. The plane of the reef flat and the plane of the wall meet at right angles. It is possible to stand on the flat and look straight down into the blue well of the drop-off. The face of the wall is a garishly ornate facade of red seaweeds, golden butterflyfish, silver crinoids, pink tube corals, yellow sponges; violets, and blues, greens and assorted neon hues. Cruising the blue off the wall is a ceaseless traffic, jacks and barracuda in the near lane, black-tip sharks patrolling the far lane at the edge of visibility.

Faulkner pulls on an old shirt and pants to protect himself from the stinging corals. Today he dives for chambered nautilus, bringing them up from the depths to photograph them in the ambient light near the surface. Next

SPORT DIVER DESTINATION DATA

PALAU

GENERAL

Location: 500 miles west of the Philippines and 400 miles north of the Equator
Size: 97 square miles
Topography: flat, hilly islands with seaside cliffs
Climate: tropical with 156 inches of precipitation annually
Population: 12,000
Largest towns: capitol Koror (pop. 7500)
Languages: Belauan, Japanese, English
Ethnic composition: Micronesian
Monetary unit: U.S. dollar
Diving season: June-Dec.

DIVING

Water temperature: winter 86-88°, summer 86-88°F
Visibility: 150+ feet, rainy season June-Oct. reduces visibility to 90-100 feet
Depth of dives: 5-200 feet
Tidal fall: 6 feet
Types of diving: reef, wreck, wall, night, cave, beach
Skill level: novice, intermediate, advanced
Dives per day: 4
Diving craft: fair
Sights:

Fish: angel, butterfly, grouper, jack, variety of tropicals

Coral: staghorn, gorgonian, sea fan, vase
Sponges: wide variety of Indo-Pacific sponges

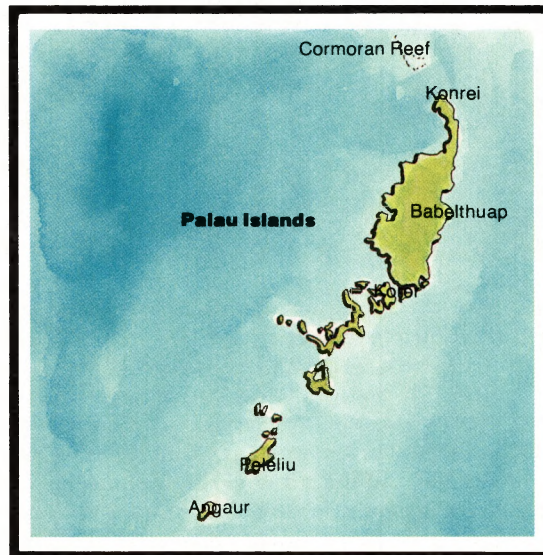
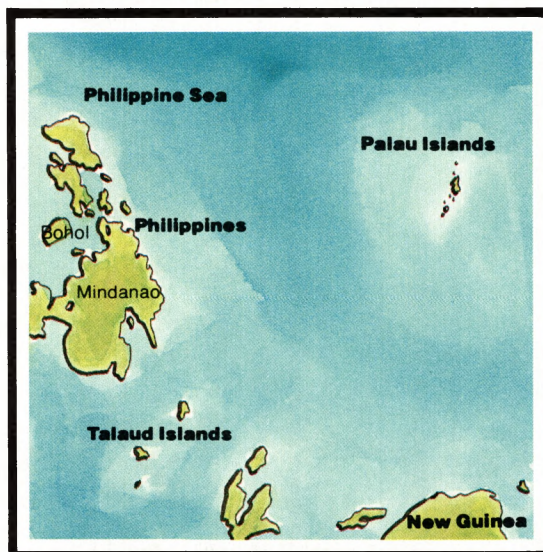
Shells: wide variety of Indo-Pacific shells

Invertebrates: sea urchin, sea star, anemone, reef shark, gray shark, white shark, black tip shark, manta ray

Restrictions: No spearfishing; no live shells or corals may be taken

DIVING SERVICES

Instruction available: none
Equipment rental: mask, fins, snorkel, weight belt, weight, tank, backpack (few supplies available—bring your own)
Equipment sales: mask, snorkel



PALAU ISLANDS

Equipment repair: none
Camera repair: none
Air: to 2250 psi
Guides: excellent

DIVERSIONS

Ground transportation: bus, taxi, rental car, motorbike
Shopping: good but expensive
Restaurants: good and reasonable, average meal \$7.00
Nightlife: fair
Other sports: sailing
Don't Miss: Ngemalis Islands reefs, Aero Belau flyover

JUST IN CASE...

Hospitals: Mac Donald, Memorial Hospital, Koror, Palau
Recompression facilities: MacDonald Memorial Hospital, Koror, Palau
Marine Rescue: none
American Express: none
U.S. Consulate: none

PLANNING

Diving tours: Poseidon Venture Tours, 363 San Miguel Dr., Newport Beach, CA 92660 (714) 644-5373

Land tours: Bena Sakuma, Koror, Palau

On your own: Airlines - Continental Airlines

Airports: Airai Airport, Babeldaab, Belau

Cruise lines: none

Marinas: none

Accommodations: Palau Continental Hotel, P.O. Box 310, Koror, Palau, Western Caroline Islands 96940

Campgrounds: none

Customs and Immigration:

Requirements—entry permit or tourist card

How much cash may you bring into the country? unlimited

Associations and clubs: none

Bibliography: *This Living Reef* by Douglas Faulkner (NY: New York Times Books, 1974); *Living Corals* by Douglas Faulkner (NY: Potter, 1979); *Micronesia Trust Betrayal*, McHenry (Carnegie Endowment); *With Their Islands Around Them* by Ken Brower

Where a notation "fair," "good," or "excellent" appears after an item, such as guides or diving craft, it refers to the *availability* not the quality of the services.

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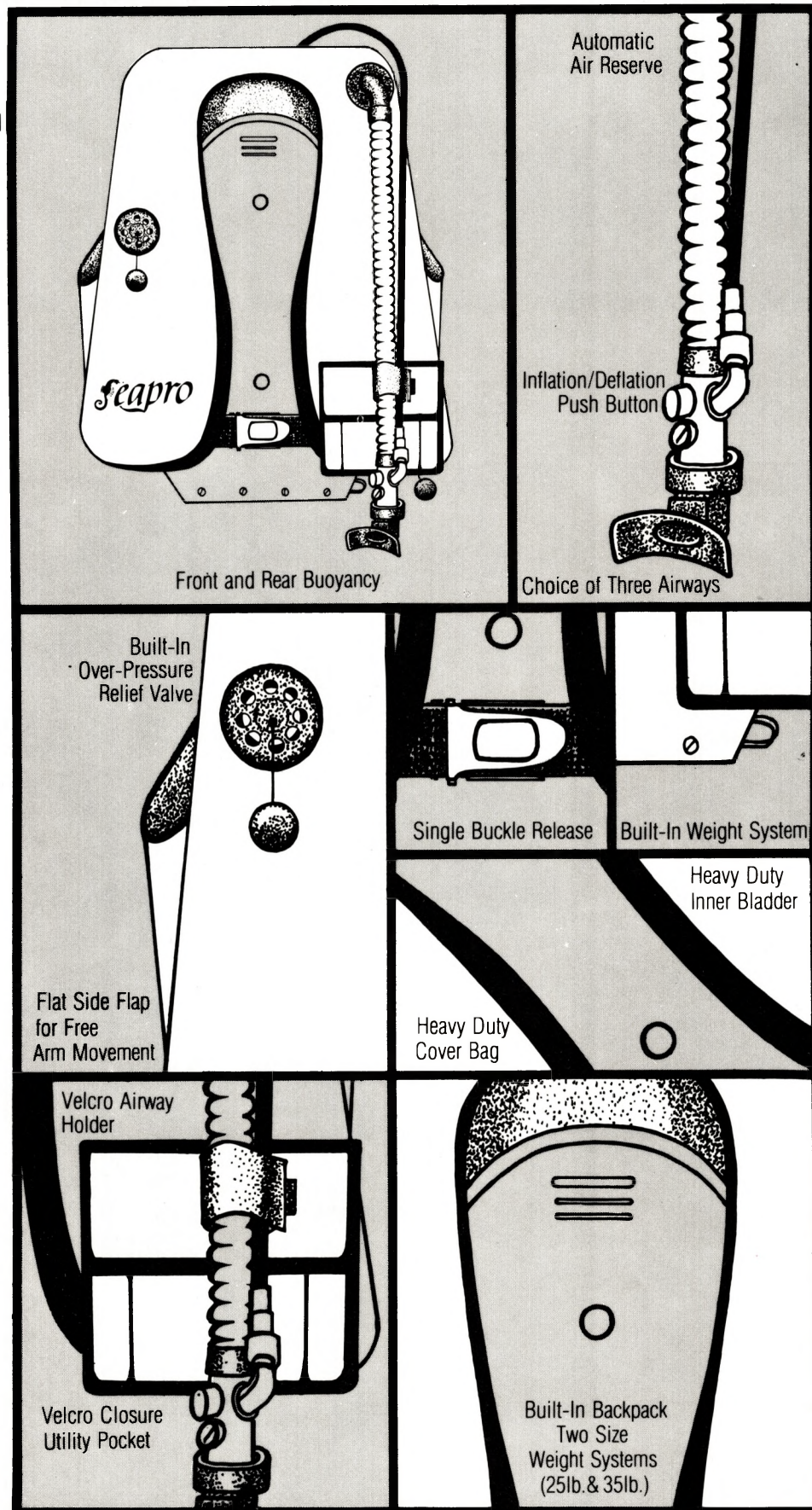
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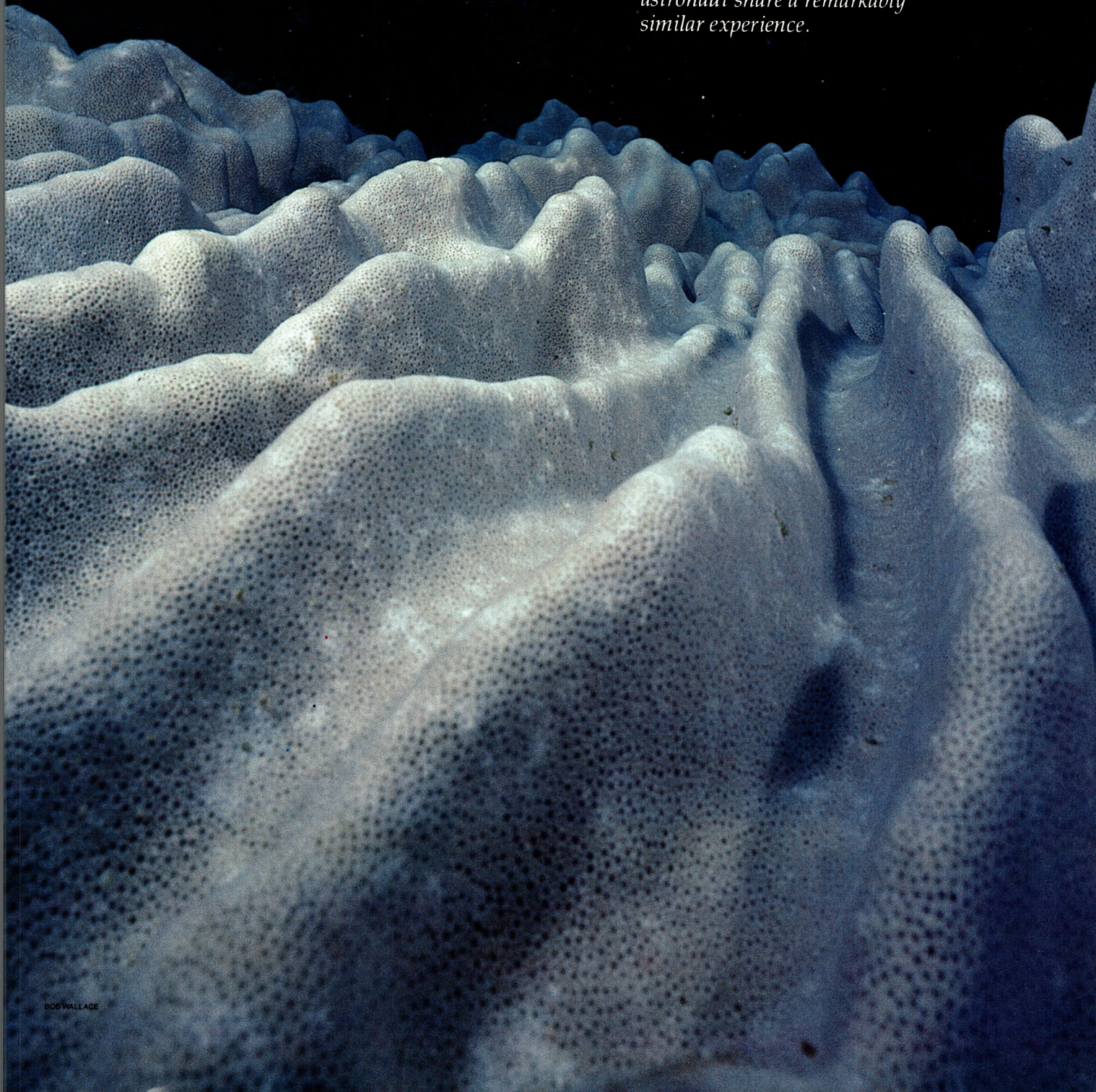
DEALERS: If you are interested in becoming a Security Jacket dealer, forward this coupon to Seapro and we will contact you.

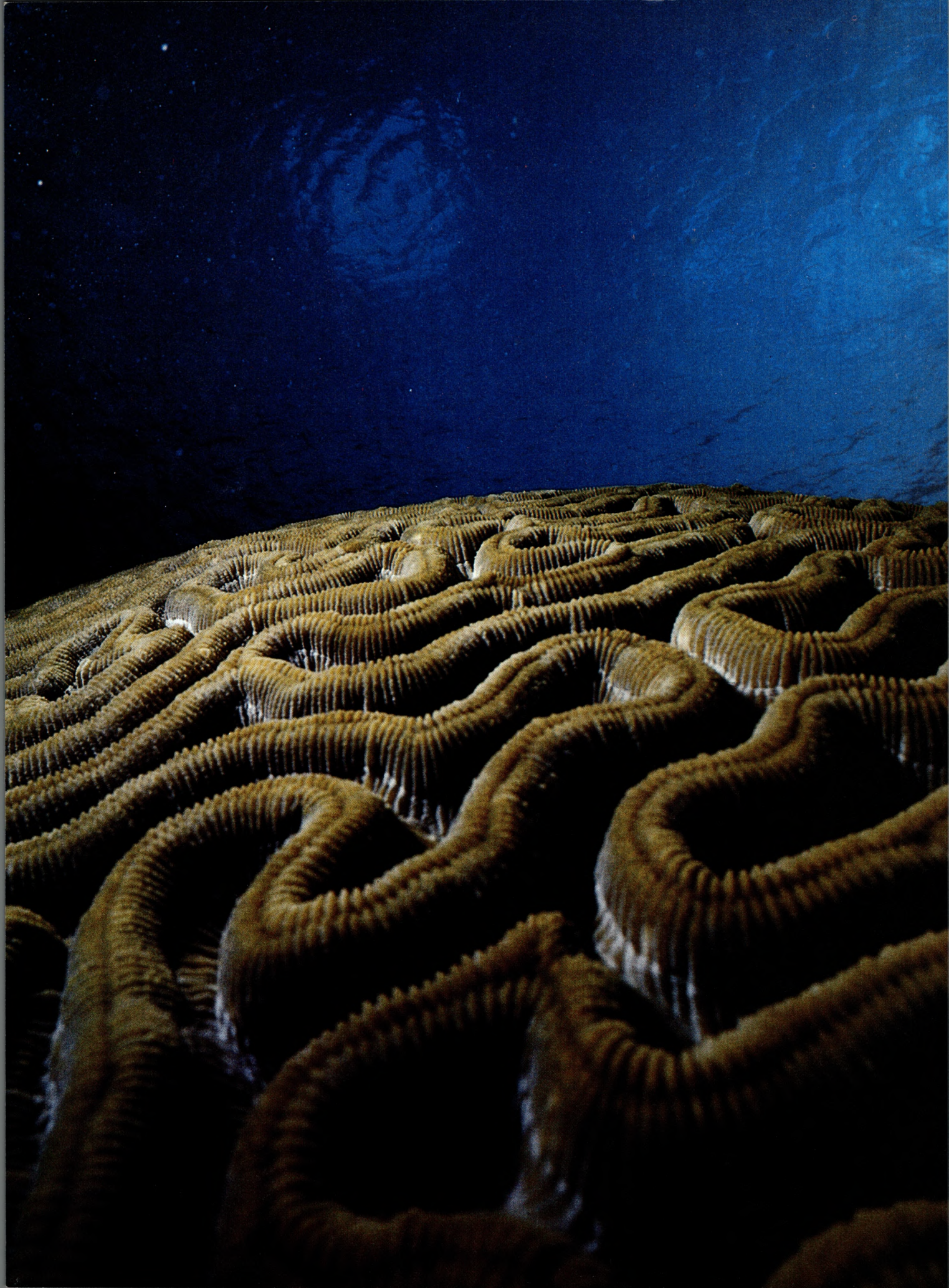


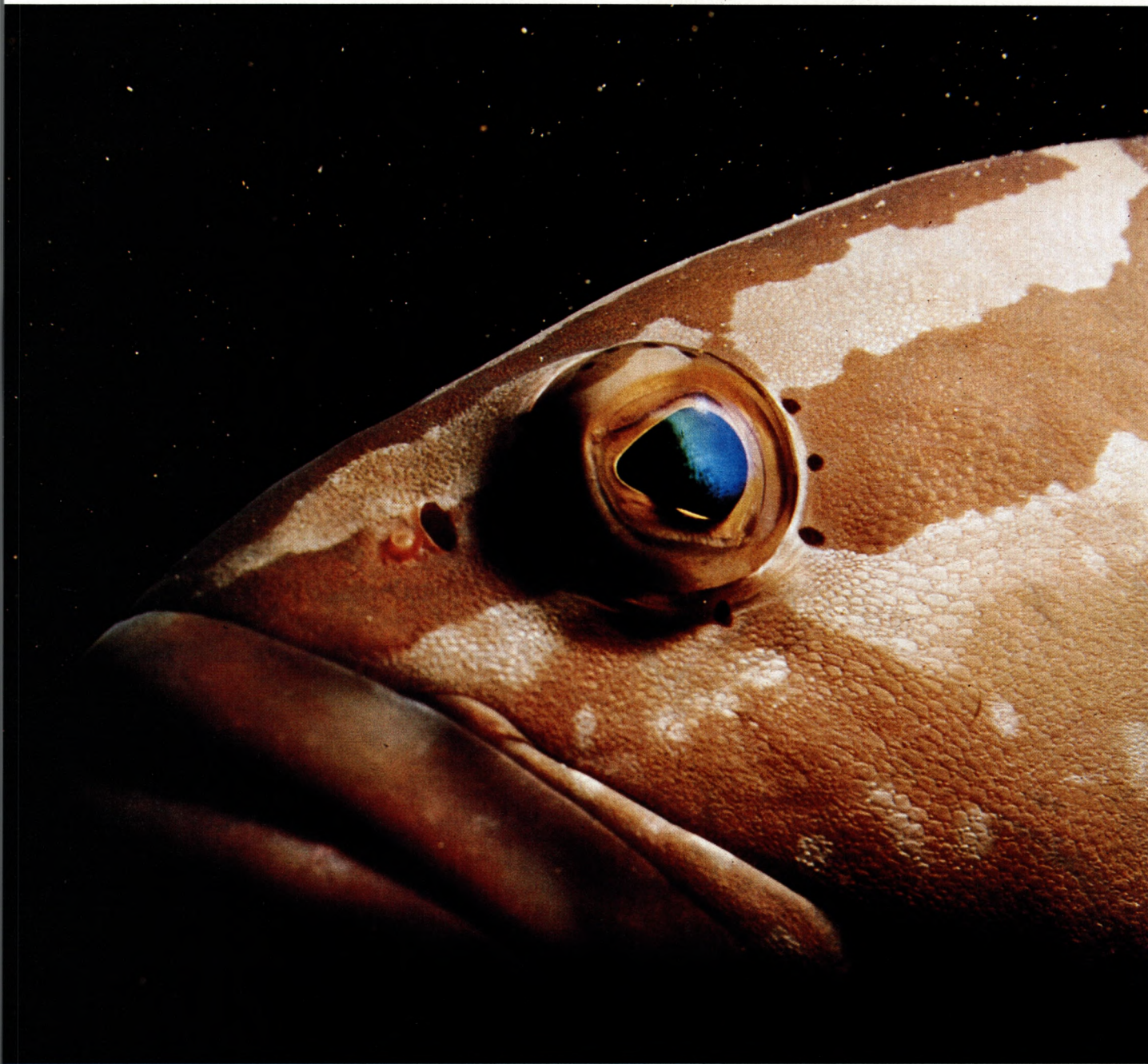
Portfolio:

Inner Space

Suspended weightless in a black void, hovering over stark landscapes, the aquanaut and the astronaut share a remarkably similar experience.







DAVID DOUBILET

BOB WALLACE

Left: Convoluted brain coral with polyps withdrawn photographed off Bonaire, Netherland Antilles. Above: A Nassau grouper on the Andros Wall, Bahamas.

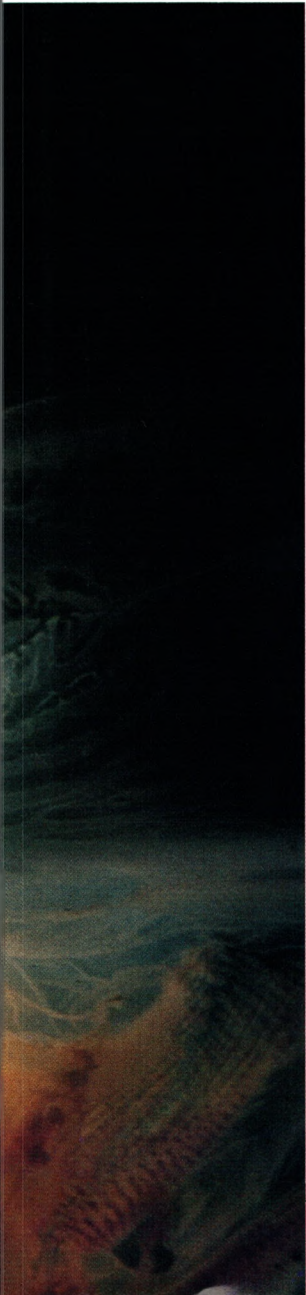
Right: A polychaete worm, Loimia medusa, dislodged for study from its bottom-debris encasement off Belize, Central America. Preceding page: The surface of a soft-bodied encrusting sponge off the Natal coast of South Africa.



Right: A lion's mane jellyfish, *Cyanea capillata*.
 Far right: Comb jellyfish, *Pleurobranchia pileus*.
 Below: Closeup photograph of a moon jellyfish, *Aurelia aurita*, back-lighted with a strobe to show the parasitic arthropod within.



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◀ The Kodak super-8mm model XL 330 movie camera in Ikelite housing.

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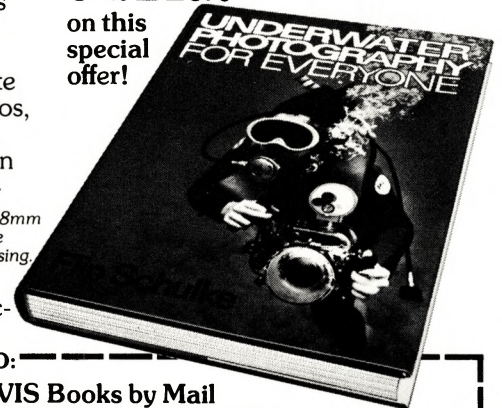
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FOR YOUR INFORMATION

Life-sized whales? Nope...larger.

The world's largest indoor cinema this summer will screen a 20-minute documentary featuring Red Sea corals, California sharks and humpback whales near Hawaii cavorting on a screen portraying them larger than life size. The Cinesphere at Ontario Place near Toronto will present the film, tentatively titled *Nomads of the Sea*, July 1 through October 15 on a screen 80 feet wide and as tall as a six-story building. To maintain high resolution across such a large image area, producer John Stoneman used a 65mm film format developed by IMAX Systems. Each frame is nearly the size of a postcard, and at a 5-1/2 frames per second a 1000-foot roll is exposed in less than three minutes at a cost of \$1000 per roll for stock and processing. The 350-pound camera, shown above in the Red Sea hefted by cinematographer Chuck Nicklin, is one of only four cameras of its type so far built. Handling the monster camera required a hoist and two men to get



it in and out of the water, and a delicate balancing act by Nicklin. Screaming past the pressure plate at almost six feet per second, the bulky film rapidly tilts the camera's center of gravity from front to back as exposed film collects on the take-up reel. The finished product, a documentary stressing the importance of ecological balance in the sea, was filmed in the Red Sea near the southern tip of Sinai Peninsula, in Hawaiian waters between Maui and Lanai, and 25 miles off the California coast near San Diego.

The Rhone's Sistership: The Fatcs

The 1974 wreck of the *Cortensor Senior* (or *Cartanser Senior*, or *Certanza*, *Cortensa*, *Cortenser* or *Cortener* depending on which St. Thomas newspaper is quoted) is safe. U.S. Corps of Engineers' plans to remove the 180-foot cargo vessel from Gregerie (or Gregorie, or Gregory) Channel, St. Thomas, U.S.V.I., as part of a \$600,000 harbor-clearing project were modified to exclude the ship because of considerable local opposition to the idea. The wreck is not a hazard to navigation, and concerned groups want it left alone. The ship "could be one of the most popular diving sites in the Caribbean," according to Conservation Department official Paul Adams. Adams and others want the ship towed to Buck Island as an attraction for visiting divers. A sistership to the *Rhone*, subject of a major motion picture, the *C. Senior* was abandoned in G. Channel in 1972 (or 1973) after a small leak hardened her cargo of cement, making it worthless. For the record, that's "*Cortensor Senior*" and "*Gregerie Channel*."



Great Escapes: The Ultimate Product Test

It was a frigid November night in 1968 when Bernd Böttger made his desperate bid for freedom, eluding East German border guards by swimming an impossible 15 miles through the bone-chilling chop of an angry North Sea. He shouldn't have made it. The sea was too cold for any man to survive such a trip; the water too rough, the distance too great. But Böttger had come prepared, armed with a bizarre de-

vice he had secretly labored for a year to build. The gasoline powered vehicle Böttger invented pulled him along at three miles per hour at a depth of 18 inches. It was light enough to hand carry and quiet enough to escape the notice of wary patrol boat crews. Only two small tubes broke the surface—snorkels of the determined refugee and the machine on which his life depended. After a brutally cold five hours, a numb Böttger was dragged onto the deck of a Danish lightship riding to anchor 15 miles off the coast. His calculations had been precise. His endurance was gone. Only vapors remained of the 1½ gallons of fuel Böttger had estimated he'd need. End of story? Nope. The amazing little machine's success story had only begun, and Böttger the hopeful escapee that night became the successful inventor. Redesigned, mass produced and marketed first by Rockwell International, later by AquaScooter, Inc., Böttger's device gained wide popularity as a means of propulsion for divers and snorkelers. These days, Böttger's brainchild is smaller, lighter, faster, safer and available for less than \$300. Write AquaScooter, 43 Commerce St., Springfield, NJ 07081.



Rust Kills

Aluminum tanks are safer than steel according to a report released by the University of Rhode Island Sea Grant program. To help minimize corrosion, the report recommends storing all tanks upright under minimum pressure. If emptied to 0 psi, water may enter the tank and it should be opened, rinsed with fresh water and completely dried. Interiors should be checked at least once per year; once each three months in the tropics. For the complete report "*Corrosion of Steel and Aluminum Tanks*," send \$2 to URI Marine Advisory Service, Narragansett Bay Campus, Narragansett, RI 02882.

Alvin Discovers New Creature

Giant sea worms discovered at 8000 feet near the Galapagos Islands in January may be an entirely new division of the animal kingdom according to scientists at the Smithsonian Institution. First observed and collected by the deep diving submersible *Alvin*, the worms are "without precedent

in the whole animal kingdom," says Dr. Meredith Jones, curator of the institution's Division of Worms. The worms create 10-foot tube-shaped white sheaths of a pliant material so tough it "dulls a razor blade." They grow on the sides of deep rifts where hot water boils up from the sea floor, absorbing nutrients through a red plume thrust up from the worm's free end.

continued

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FOR YOUR INFORMATION *continued*

Free U/W Photo Show Available

A collection of exhibition color prints featuring the work of top professional underwater photographers and talented amateurs is now available free to film festivals and trade shows. Scuba Chrome International will send the traveling salon to any qualified group willing to pay return postage and distribute promotional brochures during display of the exhibit. The salon features mounted color prints by Rick Frehsee, Jack McKenney, Burton McNeeley, Geri Murphy, Flip Schulke, Richard Stewart,



Paul Tzimoulis and others. Contact Bob Burkhard, Scuba Chrome, 4911 W. Grace St., Tampa, FL 33607.



Ellis Brings Whales to the Mile-High City

Marine artist/historian Richard Ellis has completed a wall mural commissioned by the Denver Museum of Natural History for a new marine life exhibit now open to the public. In addition to the fin whale shown above receiving final touches, the mural includes a beluga, two narwhals and a killer whale in an underwater environment. The museum's new exhibit features a 56-foot articulated skeleton of a fin whale, and eventually will include more of Ellis' work—the first complete series of scale drawings portraying all the world's whales, dolphins and porpoises. Ellis, whose work has appeared in *Audubon*, *Reader's Digest*, and *Encyclopaedia Britannica*, the Academy of Natural Sciences and the American Museum of Natural History, is a regular contributor to *Sport Diver*.

Safety on Tape

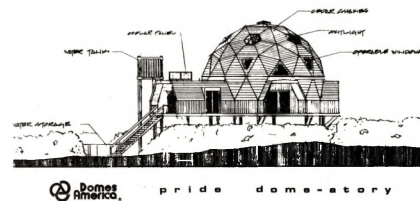
A two-part cassette tape lecture on diving safety by author Christopher W. Dueker, M.D., is now available. *Essentials of Diving Medicine* covers diver selection, diving and drugs, water safety, drowning, barotrauma, nitrogen narcosis, decompression sickness, breathing mix, rescue and first aid. Two tapes \$11.00 from Diving Safety Digest, P.O. Box 2735, Menlo Park, CA 94025.

PADI Computerized

The Professional Association of Diving Instructors has computerized its operations. The new system processes 400 certifications per terminal per day according to Sonna Whisenand, PADI's operations manager. Whisenand says the addition of an IBM computer to the PADI staff "triples our capacity to service instructors and training facilities."

NAUI: 750,000 and Counting

Three-quarters of a million divers now hold C-cards issued by the National Association of Underwater Instructors according to NAUI representative Jeanne Bear Sleeper. The milestone is noteworthy, Sleeper says, as "NAUI courses are twenty per cent longer than other dive training courses." NAUI offers more than 20 different certification courses for beginning through advanced dive instruction.



PRIDE in Turks and Caicos

Ground has broken for a new, dome-shaped field laboratory on Pine Cay in the Turks and Caicos Islands, B.W.I. The Foundation for the Protection of Reefs and Islands (PRIDE) commissioned the facility to house an applied research laboratory, educational facilities, a reference library, a museum, and accommodations for a resident director and visiting researchers. The 39-foot geodesic dome will be completely powered by sun and wind through the use of solar collectors and a windmill. Shortly after completion in June, the Foundation's new facility will offer a course in tropical marine ecology in cooperation with the University of Connecticut. PRIDE was established in 1976 to help avoid the degradation usually associated with commercial development by providing suitable alternatives.

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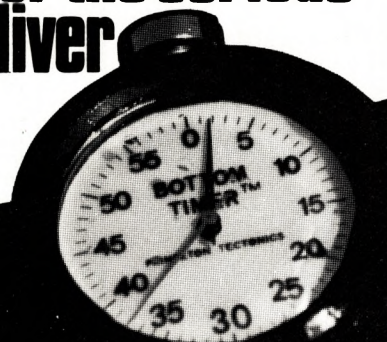
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FOR YOUR INFORMATION *continued*

U-352 and You

Almost 40 years after it sunk off the North Carolina coast, the World War II German submarine U-352 continues to harass the U.S. Navy, assorted congressmen, federal agencies and at least one senator (Spring 1979, p. 34; Summer 1979, p. 14). A 1978 investigation by the Navy, instigated by Sen. Lowell Weicker (R-Conn), discovered "dangerous" live ordnance aboard the sub. Plans by the Navy to "render harmless the hazards posed by unexploded ordnance" were made after the German government gave permission to disturb the wreck, considered the tomb of at least 11 crewmembers. Local salvors want the sub blown apart. Local sport divers want it to remain intact as an historical artifact and a haven for marine life. Weicker, himself a diver, wants the wreck preserved, but only if it can be rendered harmless. The Navy, caught in the middle of a burgeoning controversy, is surveying the sub to determine whether it can be safely disarmed without detonating the ordnance. Now the Environmental Protection Agency has joined the fray, calling for an environmental impact study because of oil and fuel supplies believed still aboard. In a March letter to Congressman L.H. Fountain (D-N.C.), a Navy official said no action will be taken until completion of an "environmental impact assessment." It still remains to be seen what, if any, actions will be taken.



Seanario '79

The first Philippines Underwater Symposium and Film Festival, held March 27 through April 1 in Manila's Philippine International Convention Center, brought together some of the world's foremost underwater photographers, marine ecologists, diving instructors and writers for a week of exhibits, oral presentations, workshops and symposia. Contributors including Dr. Sylvia Earle, Dr. Edgardo Gomez, Jack McKenney, Ralph Shamlan and Richard Stewart highlighted the program, doubling as workshop directors after oral and film presentations on underwater photography, diving equipment and future technology.



Honeymoon Lost & Found

Did church bells ring for you Saturday, April 21? If they were followed by a diving or boating honeymoon in John Pennekamp State Park on April 26 and 27, we have good news for you. Night divers at the park found this week-old engraved wedding band on Molasses Reef. They are holding the ring for identification. Contact Ernie Krumbein, Divers World of Key Largo, FL 33037, (305) 852-5498.

"Super Shark" Just Another Fish Story

How big was the largest shark that ever lived? Estimates ranging from 60 to 100 feet have been common within the scientific community, resulting in the now famous "recreated" shark jaw exhibit in the American Museum of Natural History in which "six fully grown men can stand." But the museum's crowd pleaser may have been a bit exaggerated. Recently discovered teeth of the 25-million year old *Carcharodon megalodon*, history's largest shark, are about 4½ inches high, indicating a maximum body length of less than 45 feet. Working from dimensions based on the new findings, Dr. C.J. Jeremiah created a replica of the ancient monster for an exhibit at Planet Ocean in Miami, Florida. The result? A more modest monster 44 feet in length that, had its diet included fully grown standing men, probably could eat only two, not six, at a time.

Camp de Mar Study Programs

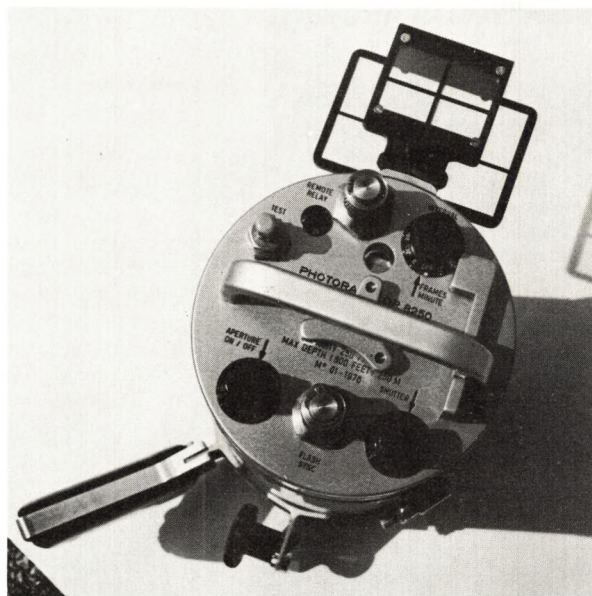
Up to six weeks' instruction in ecology of the sea will be offered July 1 through August 15 at Las Gatas Beach on the west coast of Mexico. Structured studies in marine environment, lifesaving, CPR, diving, sailing, photography, yoga and dance will be available. Participants will sleep in palm thatched huts and will be responsible for daily chores and maintenance. Enrollment is limited to 30 persons in good health who are capable of swimming 100 yards without aids. Cost for the full camp including all meals and tuition is \$1000. Shorter stays will cost \$200 per week. Travel Plans International, 1301 W. 22nd St., Oak Brook, IL 60521.

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FOR YOUR INFORMATION *continued*

Key Largo Opens New Facility

Ocean Divers' new full service dive store in Key Largo, Florida, features full gear rentals, freshwater showers, an open-air restaurant and easy access to Pennekamp Underwater Park. An accredited PADI training facility, Ocean Divers' new ocean-side complex offers open water checkouts, underwater camera instruction, and over-night Ektachrome processing on premises. Former Chief Lackey Pam Dickinson's new responsibilities as Super Chief Lackey include cobweb maintenance, shrubbery execution and ego inflation. Good luck, Pam; our congratulations, or sympathy, whichever is appropriate. Ocean Divers, P.O. Box 1113, Key Largo, FL 33037.

Gold Coast Dive Boat Launched

Professional Diving Schools of Florida has launched a new custom-built Delta dive boat for daily trips to sites along the southeast coast of Florida. The 34-foot M/V *Experience* is Coast Guard certified to carry 18 passengers plus crew, and is available for day trips or liveaboard charters. Staffed by five PADI open water instructors, two Coast Guard certified captains



and many divemasters, PDSF offers training in basic scuba, navigation, lobstering, marine life identification and drift diving. Contact Professional Diving Schools of Florida, 210 N. Federal Hwy., Deerfield Beach, FL 33441.

Jamaican Advanced Diver Plan

The Jamaica Hilton Aquatic Club in Ocho Rios offers a new six-day package for advanced certified divers. Available for groups or on an individual basis, the group package includes Hilton accommodations, breakfast and dinner daily, two tanks per day, weights, tanks and back-pack. Individual package offers the above plus a free sailing lesson, cocktail party, discount shopping and a bottle of Jamaican liquor. From April 1 through December 20 the complete package cost is \$421.50 each for groups of 15 or more; \$431 on an individual basis. Contact the Hilton Reservation Service for more information.

Baja California Research Cruise

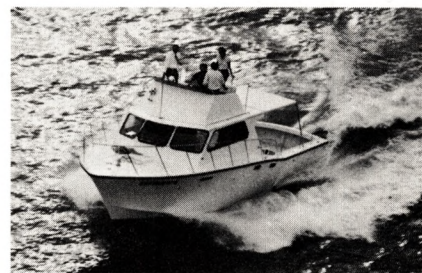
Explore the Sea of Cortez as a member of a scientific research expedition aboard the 120-foot *Baja Explorador*. Week-long diving expeditions along the Baja coast combine recreation and research under the direction of noted Mexican and American marine scientists. Data collected will be



analyzed for projection studies of potential marine refuge sites, mariculture programs and to monitor the status of reef environments. Each dive will be recorded in the ship's research log with your name as a member of the scientific crew. College credit is available for some expeditions. Contact Baja Expeditions, P.O. Box 3725, San Diego, CA 92103.

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- THE ORGANIZATION:** The Dominica Project is organized and directed by SEABORNE VENTURES, INC., the largest and most active treasure salvage company in the world with 14 years of field experience in Belize, the Bahamas, Dominican Republic, Honduras, Colombia, Florida, and offshore reefs throughout Latin America and the Caribbean.
- THE LOCATION:** The Project will operate from land bases on the recently independent island nation of Dominica, northernmost of the Windward Islands. Located between Martinique and Guadeloupe, Dominica is the least commercialized and the most ruggedly beautiful of any major Caribbean island. Although only 29 miles long and half as wide, Dominica has 100 miles of white and black sand beaches surrounded by crystalline waters that remain at 82 degrees year round. The interior of the island is dominated by peaks that rise to 4,700 feet and are covered by verdant, lush tropical rain forests harboring some of the most exotic flowers and spectacular waterfalls anywhere.
- THE OPERATION:** The Project will be divided into two general operational phases; Exploration (Search and Survey) and Salvage. The 152 foot Research Vessel *JAMES BAY*, Seaborne's primary salvage ship, will be available for use. This ship is equipped with decompression chamber, desalinization unit, six ton hydraulic deck crane, radar, complete navigation and communication gear, prop blasters, etc. Several other smaller vessels will also be employed along with dredges, airlifts, magnetometers, and other specialized equipment required for the specific condition of each site.
- THE REQUIREMENTS:** Active participants must meet all of the following qualifications: (1) An ability to adapt to a tropical climate, local diet, and a native Caribbean culture, excellent physical condition to endure long hours of surface and underwater work, and a willingness to work with others toward a common goal. (2) Substantial experience in SCUBA and/or hooka diving *and* practical skill in any of the following fields mechanics, seamanship, electronics, marine salvage, photography, writing, archaeology, art, or related fields necessary to make the Project entirely self-dependent. (3) A minimum \$5,000 investment in the Dominica Project which guarantees room and board for a period of one year, round trip air transportation from Miami to Dominica, and a percentage of all profits (sale of recoveries, media earnings, exhibits, tours, etc.) realized from the Project.



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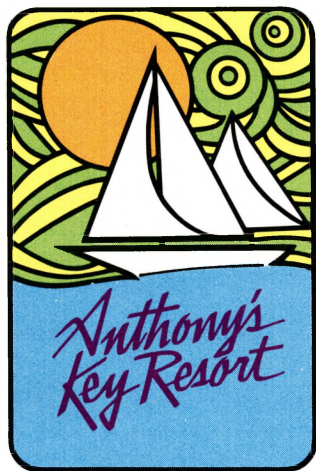
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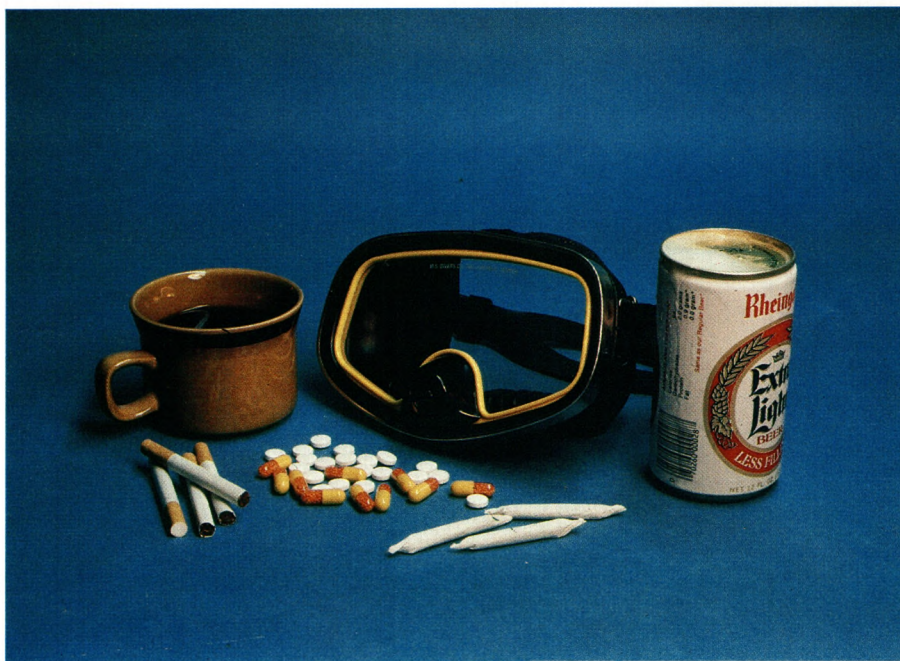
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PHYSIOLOGY

Drugs and Diving

Even common substances such as coffee and cigarettes can have very uncommon effects.



BY DR. PATRICK BRAY

You already know the punchline to this one. What do you get when you mix drugs and diving? If you're lucky, maybe nothing more than a dangerous dive buddy. What you may not know are some of the reasons drugs at depth can turn a beautiful dive into an ugly experience. Are there any drugs safe for use underwater? If so, which ones, and how much can safely be taken before a dive?

First, a definition. A drug is any chemical substance that causes physical, mental or emotional changes in a person. This includes alcohol, coffee, tea, even cola drinks and tobacco. These commonplace, socially acceptable substances are drugs, and familiarity with their use doesn't render them harmless. The same is true of non-prescription medications such as pain relievers, seda-

tives and cold remedies. The point is that many of us, maybe without realizing it, are drug users.

Without benefit of a formal survey, one may safely assume that divers as a group do not use drugs any less than the general population. Recognizing this, most certification programs place an absolute ban on drug use while diving. But few instructors explain that this warning applies to substances other than prescribed and recreational drugs. Even seemingly harmless drinks, pills, sprays and drops can produce uncomfortable or dangerous effects under pressure, and you owe it to yourself and your buddy to understand why.

From the time you enter the water, your body is undergoing many complex physiological adjustments. Suddenly your breathing becomes more labored, a significant redistribution of blood flow occurs and there is a complex shift in the way your body absorbs inert gases such as nitrogen. In order to adapt itself to its underwater surroundings, your body creates a very different in-

ternal environment; thus, the effect of any drug becomes highly unpredictable.

Our ignorance of the body's reaction to drugs under these circumstances is a powerful imperative to exercise extreme caution. Any time you dive with drugs you're taking an undefined risk; this is like playing Russian Roulette with no idea how many rounds are in the cylinder.

When you drink, swallow, inhale or inject a drug, it goes through four basic phases: absorption, distribution, metabolism and excretion. Each of these phases is subject to a broad spectrum of influences. Together they determine the body's internal chemistry. Some factors influencing a drug's effect are age, weight, general health and state of mind. The same dose which is therapeutic for a young, robust individual may be toxic for an older, less fit person. Your specific reaction to a drug may vary widely from one occasion to the next, especially if other drugs are present in the body.

Basic principles of pharmacology

continued

Dr. Patrick Bray is the senior medical officer at the Naval Diving and Salvage School in Washington, D.C.



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PHYSIOLOGY *continued*

which help predict a drug's effects were established by observing the drug responses of persons who were warm, dry, rested and under an atmospheric pressure that seldom varies more than a few millibars of mercury. Clearly, these conditions bear little resemblance to a diver's environment. If we are ever to understand the specific relationship between drugs and diving, scientists must explore some very basic issues.

It would be nearly impossible to completely assess all the complex environmental factors that may influence a diver's drug response. Some of the more obvious of these are pressure, equipment type, breathing gas, visibility, current and water temperature. Even more significant can be the interaction of these influences. For example, diving without a wetsuit in cold water with a strong current running makes cold stress likely. The effect of a drug on a cold (hypothermic) person can be suppressed until rewarming, at which time the drug may suddenly declare itself.

Even the scant research conducted so far indicates drug response while diving can be increased, decreased, reversed or entirely different from the body's normal reaction. One dramatic example of this is the well established phenomenon of pressure reversing anesthesia. Experiments have shown that anesthetized mice tend to wake up as depth increases. But how can a drug's effects be isolated from symptoms of known diving maladies such as nitrogen narcosis, oxygen toxicity, carbon dioxide retention and decompression sickness? Can a drug make any of these disorders more or less likely?

Researchers still don't know, although some drugs have been studied in an attempt to find chemical remedies for these ills. Considerable research has focused on finding a drug which can prevent oxygen toxicity. But despite some promising possibilities, there are at present no drugs which can effectively protect a diver from oxygen toxicity. Perhaps the most significant result of these studies to date has been to emphasize the difficulty of effectively applying drugs to diving related maladies.

Research which explores the relationship between deep diving and drugs has only limited significance for the sport diver. Only recently has the need for research on commonly used drugs under typical sport diving conditions

continued



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Accommodations at the Coral Caymanian are among the Island's best and a dive package at reasonable rates is available.

Athlee Evans, the only native YMCA certified, SCUBA instructor on the island has spent numerous years both on the sea as a merchant marine and under it as a divemaster. Not only will Athlee help you explore the glorious reefs and walls of Grand Cayman he will also prepare a sumptuous island fish meal and direct you to his favourite night spots for authentic native food and dancing.

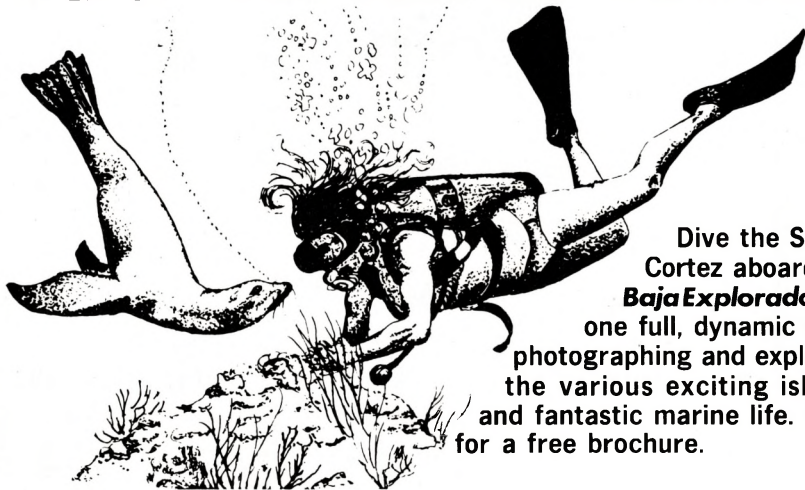
A YMCA certified Teaching Assistant, Patrick Evans has, like his brother, spent many years at sea and delights in introducing visitors to the six foot green moray eel who lives on Hepp's Pipeline, the Hawksbill turtle who might give you a ride on Jimmy's Wall and the bashful octopus who only comes out at night on the wreck of the Balboa.

Picture clear blue water at a temperature of 85°F on a sunny morning as divers board the sleek "Theresa D" for a short cruise to the world famous North Wall. Next picture the descent to the top of the reef at 65 feet where thousands of colorful reef dwellers reside including trunk fish, file fish, squirrel fish, French angels, grey angels, queen angels, trigger fish, spotted drum and trumpet fish. Picture further the undersea mountain ranges visible for hundreds of feet featuring sea fans, coral heads, gorgonia, and iridescent sponges.

Now picture a further descent along the wall that drops to the ocean floor 6000 feet below. Here glide majestic denizens of the deep, including eagle rays, parrot fish and an occasional shark. Picture the thrill of this dive. Now put yourself in this picture with the Quabbin Divers.

Athlee and Patrick invite you to dive Cayman with Caymanians and enjoy the total Cayman diving experience.

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PHYSIOLOGY *continued*

been recognized. Most compressed air dives are relatively shallow; even U.S. Navy divers log 99 per cent of their bottom time at depths of less than 200 feet. Obviously, more research should focus on shallower diving conditions if the average diver is to benefit from it.

Some progress in this direction is being made by researchers at the Undersea Medicine Society and by the Navy's Medical Research Institute. The thrust of this work is an evaluation of a drug's behavioral toxicity; that is, how a drug interferes with a diver's performance underwater. In addition to external behavior, subjective changes in mood and

TABLE 1

Prohibited Drugs

Prescribed medicines*

- Anticonvulsants
- Antiasthmatics
- Steroids
- Insulin
- Cardiac drugs
- Migraine medications

Other drugs**

- Narcotics (codeine, Demerol, Percodan)
- Hallucinogens (PCP, LSD, mescaline)
- Sedatives (barbiturates, methaqualone)
- Tranquilizers (Valium, Librium, Equanil)
- Alcohol
- Tobacco
- Marijuana

*The disease for which one of these drugs is prescribed is the primary reason to consider a ban on all diving.

**The parentheses contain certain examples which are not presented as a complete listing.



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attitude are studied. These subjective changes are important; feelings of euphoria or depression may not be apparent, but could lead to critical misjudgements.

These efforts, however, are only a start; until we know more, it makes sense to avoid all drugs while diving. But an absolute prohibition isn't always feasible; as a practical matter, divers will no doubt continue to dive while medicated. While some divers may use drugs recreationally, others have various mild

continued

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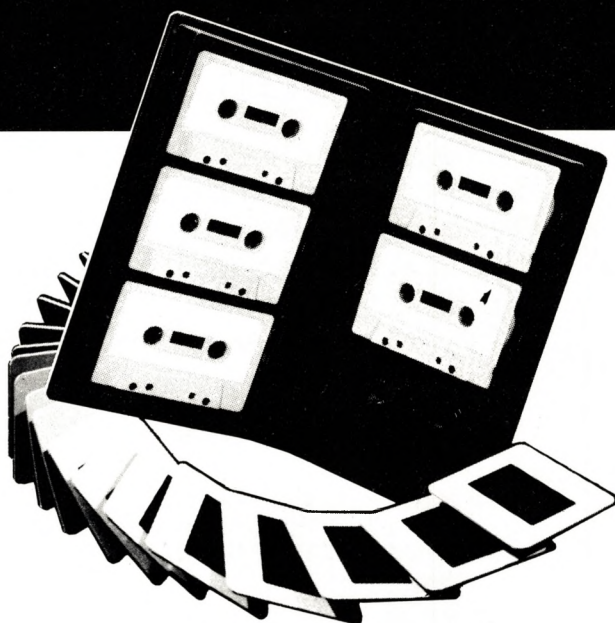


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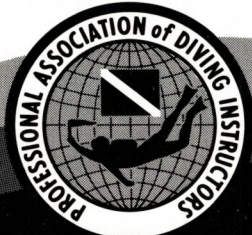
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PHYSIOLOGY *continued*

but chronic conditions requiring the use of certain drugs. Since complete abstinence is impractical for many divers, Tables 1 and 2 offer some recommendations as the *next best* advice. When reviewing them, keep the following in mind:

1—It is essential to consider whether the condition requiring medication is itself serious enough to keep you out of the water. Remember, most of the drugs listed do not cure, but simply provide symptomatic relief. Consult a health professional competent in diving medicine.

2—Never exceed the recommended dosage. Somewhere beyond the therapeutic dose of any drug is the toxic level. Diving may narrow that gap.

3—Never dive after taking a drug for the first time. Many drugs, especially cold remedies, are a witches brew of many ingredients in an irrational mix. Liquid preparations often contain alcohol and can induce drowsiness. It is foolish to discover at depth exactly how drowsy a particular drug makes you.

4—Avoid alcohol and tobacco. Alcohol depresses the central nervous system, and a less than fully aware diver is a serious liability to himself and his buddies. In addition, there is some evidence linking alcohol consumption with increased probability of decompression sickness.

Smoking interferes with the lungs' ability to clear debris. Smoker's cough, or bronchitis, increases the chances of pulmonary barotrauma and air embolism. Breathholding ability, which may be crucial in an emergency, is significantly diminished by smoking. Also, smokers have higher blood levels of carbon monoxide, which gives them a smaller margin of safety when exposed to a contaminated compressed air source.

5—Beware of Valium and similar drugs. Although these are the most commonly prescribed medications in the U.S., they are completely unsafe for use while diving. These compounds are eliminated from the body in so slow and complex a manner that drug levels may be present several weeks after use. Never dive sooner than a month after taking the last dose of this type drug.

6—Recognizing that marijuana use has for many persons passed from fad to routine, it is probably safe to assume that many divers have smoked the weed during a day of diving. Most such expeditions may not have resulted in an

continued



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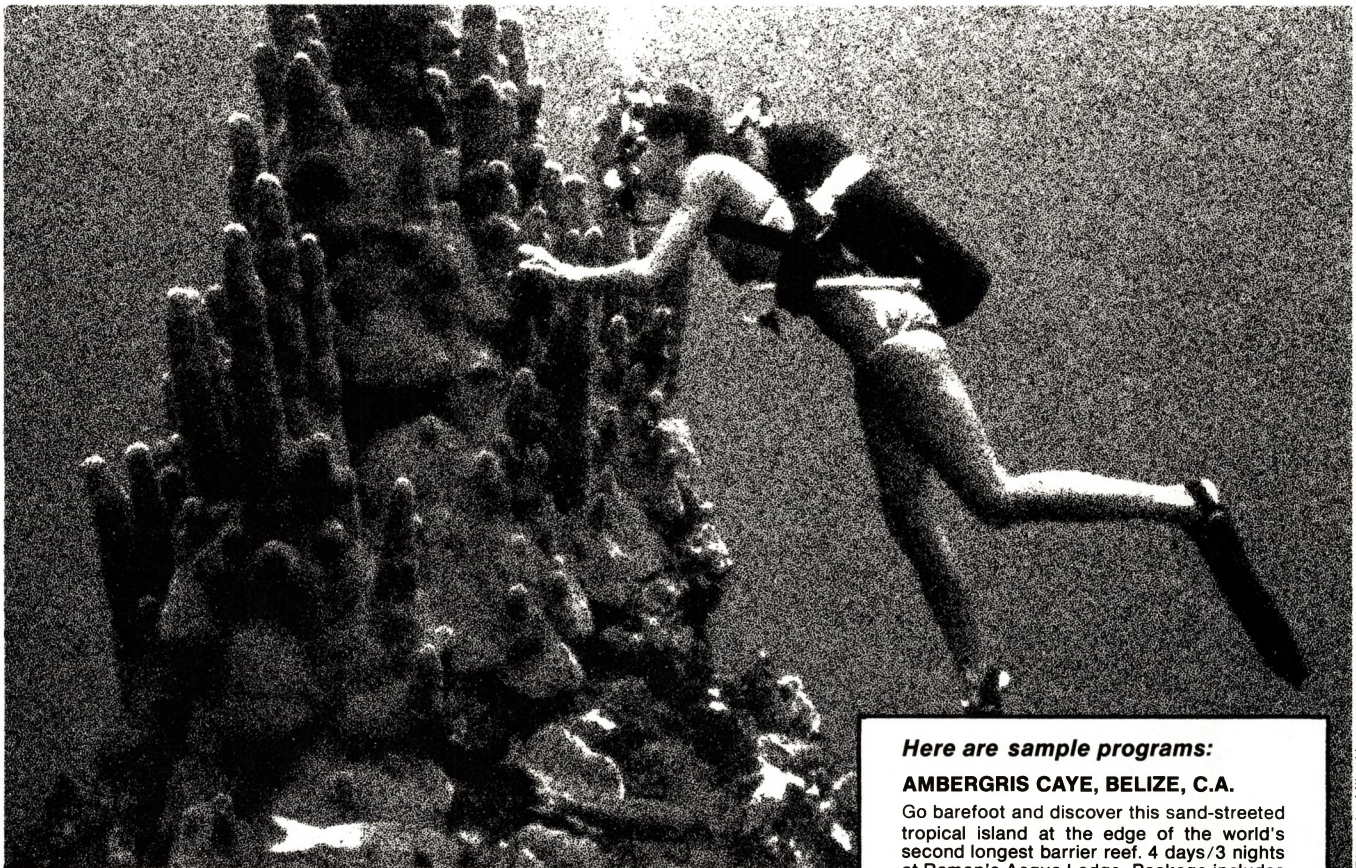
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PHYSIOLOGY *continued*

accident but, clearly, diving high is not the optimally safe condition which every diver owes to himself and his partners. Like alcohol, marijuana decreases underwater performance by distorting the brain's ability to perceive and sort information correctly.

Finally, be advised that the guidelines set forth in Tables 1 and 2 represent the author's personal opinions based on clinical experience and analysis of available scientific data. By no means is this presented as the definitive treatment of

TABLE 2

Relatively Acceptable

Shallow diving*

(less than 50 feet)

- Antihistamines, decongestants (non-prescription, without alcohol)
- Diuretics
- Motion sickness medicines.

Deeper diving

(up to 170 feet)

- Aspirin
- Acetaminophen (Tylenol, Datril)
- Caffeine (coffee, tea, etc.)
- Sudafed
- Nose drops**

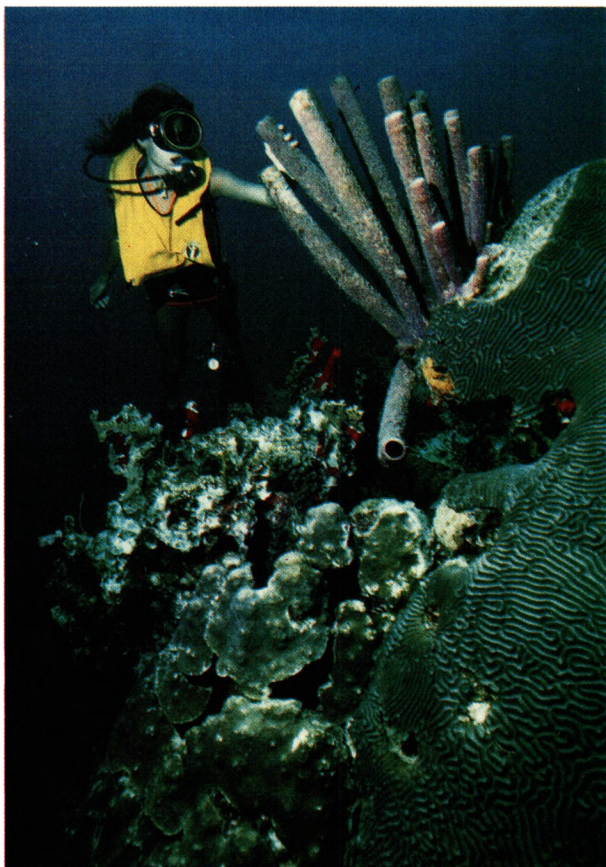
*To repeat, never use any drug for the first time prior to diving.

**As with all drugs, take as directed.

This warning is stressed for nose drops which, if taken excessively, may increase rather than decrease nasal congestion.

the subject. Any doctor's experience with dive related medical problems leads to subjective conclusions which may be affected by unintentional bias. Also, remember that anyone's previous experiences of combining drugs and diving without incident offers no assurances as to a drug's probable effect the next time around.

The current paucity of hard data leaves us with a state-of-the-art assessment in which the distinction between fact and fiction is blurred. Controversy is to be expected, and the prudent diver should be alert for new findings as more research is undertaken. But for now, the overriding consideration is this: The minor benefits of any drug are rarely, if ever, worth the increased risks incurred while diving.



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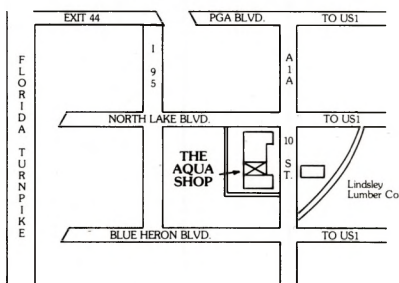
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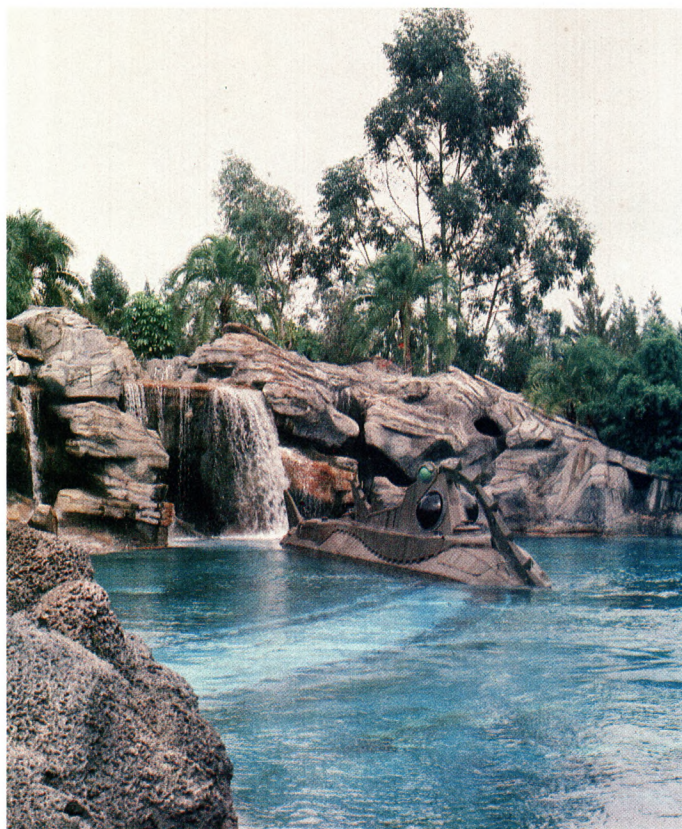
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DIVING CRAFT

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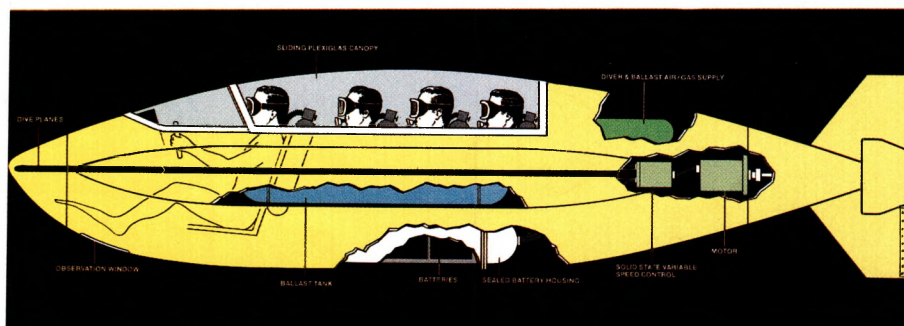
BY STEVE BLOUNT

Cast off bow lines! Cast off stern lines! Steady on, now. Dive! Dive! Dive!" Clamorous gonging fills the sweating iron hull as it settles beneath placid waters. In the cool, dim interior passengers lean forward, peering intently at coral and fish swarming around the portholes. There is no need to equalize ears, no wet suit, no regulator and no residual nitrogen time—just rapt attention to the underwater scenery.

Unfortunately, the scenery is fake. So is the submarine. It really goes underwater, but it goes on a track, like a trolley. And the water is a man-made lagoon at Walt Disney World in Florida.

But it feels real, almost, no less than you expect from a stellar exhibit in the Master of Fakery's fantasyland. Disney's *20,000 Leagues Under the Sea* takes us back to commune with childhood dreams. For most, it is as close as they

Shellback Steve Blount thinks he is Admiral of a Sport Diver sub flotilla. Since he's the editor, we won't tell him any different.



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come to fulfilling those dreams.

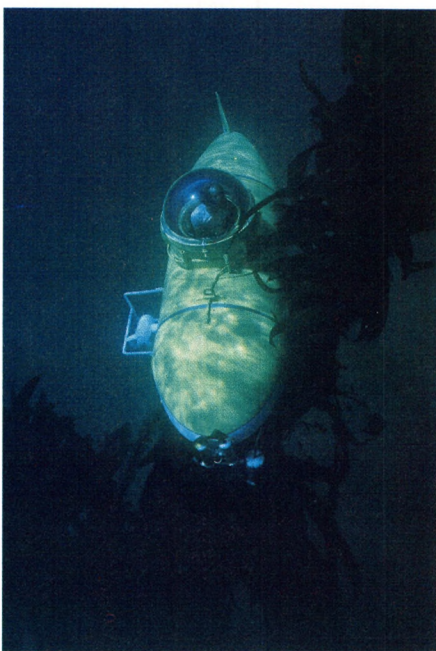
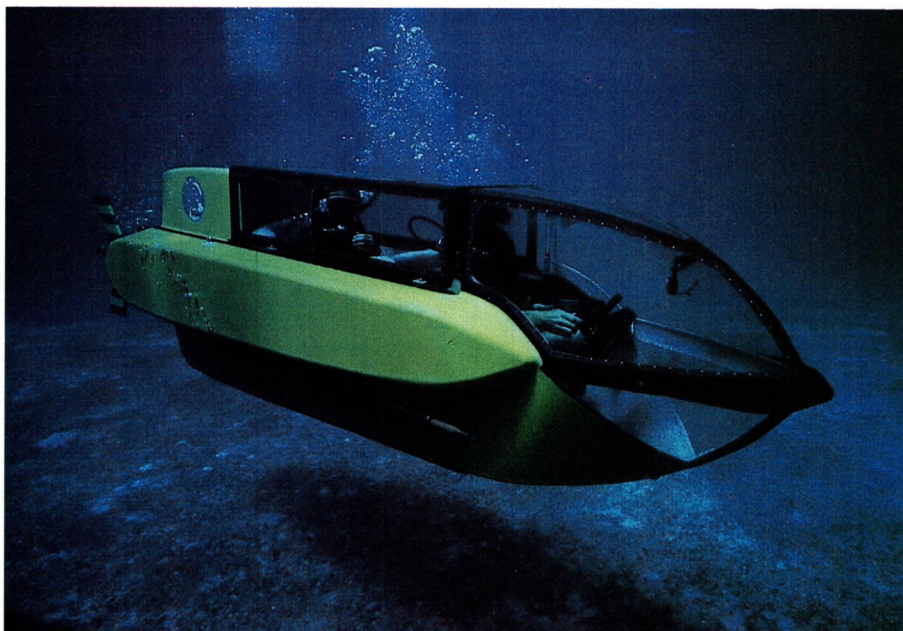
However, as a Coca Cola advertisement so profitably pointed up, Americans are hooked on the *real* thing. No fantasy is worth having if it can't somehow, someday, be materialized.

And it's finally happened with submarines. For about the price of a new Mercedes you can purchase your very own, fully tricked out, sure-enough sub. And don't forget this is America, so you can choose a model from one of three manufacturers, with options galore and a customized metal-flake paint job.

The submarine has been with us a long time, historically as a war vessel

and more recently as a research tool. But the sport sub—a small, portable vessel for recreational use—is a recent arrival. Kittredge Sport Subs, Perry Oceanographics and Underwater Propulsions have designed subs that, while fully capable of research application, are amenable to use by sub-aquatic barnstormers.

Of the three sport subs, only the Kittredge is dry. Wet subs are wet, inside and out. Pilot and passengers must wear scuba gear and are subject to the effects of pressure. The advantage here is that divers can leave the sub while it's under water. Dry subs are dry inside and their interior remains at one atmosphere of



pressure—sea level. The advantage here is a longer excursion without getting wet, cold or inducing the bends.

The long delay in utilizing subs for fun was due partially to a lack of demand and partially to a lack of technology.

"We've had to develop a lot of the technology of undersea exploration ourselves," said Perry's Ernie Richards.

And until the big push for exploitation of offshore oil deposits, there weren't enough buyers for small submersibles to make development commercially feasible.

"In fact," said Richards, "one of the standing jokes around Perry during the

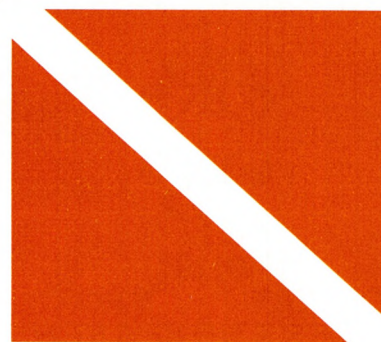
Counterclockwise from above: Perry Oceanographic's Shark Hunter II carries two divers and a \$19,000 price tag; James Bond rocket is extra. A ride in Captain Nemo's pseudo-sub costs about \$2.00 at Disneyworld. Underwater Propulsions DDV can be yours for something over \$16,500. The Kittredge K-250 dry sub gets you to 250 feet for about \$16,000.

late 60s was a motto: 'A sub in every garage.' Now we think there may be enough interest in recreational subs to justify more development."

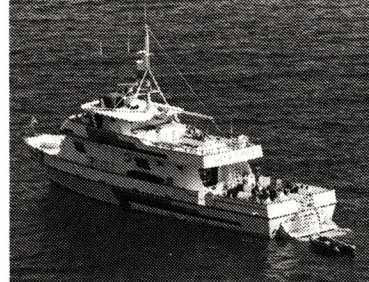
Perry's Shark Hunter II submarine was used in the James Bond film *The Spy Who Loved Me*. Perry also built the submersible Lotus Esprit auto used in the film. Perry designer Keith Andersen doubled for the SPECTRE bad guy, piloting the sub in the movie. Another Perry designer doubled for Roger Moore. For only \$20,000, more or less, you can have your own Shark Hunter II to play James Bond to an appreciative reef audience.

The Shark Hunter II is 15½ feet long, weighs 1750 pounds and will carry two divers to 450 feet. Its thruster will move the sub along at 3½ knots for four hours, or at some lesser speed for five to six hours. An instrument panel containing two volt meters, air pressure gauges, a water intrusion detector (for motor and control compartment), an hour counter and a bottom timer is mounted in front of the forward seat, as is the steering gear. The push-pull aircraft-type yoke manipulates control surfaces

continued



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DIVING CRAFT *continued*

The Nemo Syndrome

The Nemo Syndrome: origin, 19th cent., Fr.: A fascination with underwater boats manifested in an irrational desire to actually own one.

Enter, Leonard A. LeSchack, geophysicist, oceanographer and owner of a one-man submarine occasionally called the *Wet Dream*.

If this unofficial name is droll, LeSchack is not. After all, daredevils race fast cars and romantics take to the sky, but those who are touched by the Nemo Syndrome have a serious mission.

Unlike Jules Verne's Nemo, who wanted no part of mankind or its problems, LeSchack has directed his submarine squarely at one of our most civilized concerns—oil.

The idea occurred to him several years ago when his company, LeSchack Associates, Ltd., was analyzing data gathered under Arctic ice by big U.S. submarines.

In the summer of 1976 he took delivery of the *Wet Dream* from its builder, George Kittredge. It was not the *Nautilus*.

Officially known as the K-250, LeSchack's boat was a cigar-shaped steel cylinder with special guard rails to protect it from the ice. It was stubby and unassuming and its outstanding feature was its cheerful color—lemon yellow.

Housed in a garage at Rockville, Maryland, the *Wet Dream* may have appeared to a few cynics to be an object of amusement. But to LeSchack she was every inch a machine of commerce. With a certain pride he handed a visitor the official guide to manned submersibles showing the K-250 in the company of super-boats such as the *Aluminaut* and *Star-I*. If the *Wet Dream* was in another class at least it was in the same book.

"She's very uncomplicated," says sub pilot Mike Edwards, a diver and electronic engineer. "She takes some getting use to."

The *Wet Dream's* uncomplicated design has been demonstrated often—sometimes almost comically.

During a trial run in a Pennsylvania quarry, Bob Landers, a NAUI instructor and Trident's diving consultant, was at the controls

when the sub hesitated, lost buoyancy and settled to the bottom in a cloud of silt. Support divers swam frantically into the murk and peered through the dome. They saw Landers seated calmly at the helm, a K-250 instruction manual in his lap. Afterwards he explained he was trying to figure out a nuance of operation, which he found at last at page three.

In a paper recently submitted to a professional society of ocean researchers LeSchack makes a strong case for small submersible operations in the Arctic:

"...Because the majority of Arctic operations are conducted at shallow depths (about 60 feet), a K-250-type submersible is the most efficient, cost-effective vehicle for the kinds of tasks undertaken there."

Most under-ice work requires only a limited range and a tethered mode, eliminating expensive navigation equipment which raises the price of super-subs by one or two orders of magnitude.

"Why pay hugely for what you don't need?" LeSchack asks.

Recently the Nemo Syndrome has carried the Trident team, now managed by ex-hard hat diver/cameraman Rick O'Donnell, into an environment totally unrelated to the Arctic. An imaginative Caribbean resort operator (who must at present remain anonymous) believes the *Wet Dream* can come true for would-be Nemos taking a specialized submarine course.

As a sport diver LeSchack likes this idea. And as a businessman he sees a way to conduct more tests and build the sub's work capabilities.

Time and money will build the sub's repertoire of skills. And soon LeSchack hopes to be in a position to prove his case and offer positive value for every dollar spent by his future clientele. The sub's unofficial name, *Wet Dream*, will become something more elegant as reality is translated into dollars.

"Everyone I talk to agrees," says LeSchack. "The project makes good business sense. Now we're going to prove it."

Well spoken. Captain Nemo would be proud.
—Phil Trupp

mounted aft, directing the sub's approximately 150 pounds of thrust.

Two integral hydrospheres offset the vehicle's weight; a main ballast tank in the passenger compartment and a trim tank directly behind the pilot compensate for extra equipment weight and keep the sub neutral at depth. The internal air system is supplied by two standard scuba cylinders. Emergency life support is provided by two second stage regulators attached to these cylinders.

Of course Perry will customize your Shark Hunter II with any type of communication or navigation equipment. They also offer optional battery chargers which bring the cells up to full power in less than 12 hours and a customized boat trailer.

Perry has developed a special package deal on their Shark Hunter II and a launch/recovery support vessel called the Ocean Hunter. An Ocean Hunter equipped with a Shark Hunter II will weigh in at a hefty \$200,000 plus. But it is undoubtedly the most sophisticated, most comfortable, most complete submersible package going. The Ocean Hunter is a 42-foot offshore dive boat with open transom stern ramp and a hydraulic sub recovery device. Twin turbo-charged Caterpillar diesels push the Ocean Hunter at 26 knots, and the fuel tanks hold up to 700 gallons of fuel. It sleeps four in comfy forward quarters. The prototype Ocean Hunter has a fake-fur padded ceiling and a microwave oven. The standard Ocean Hunter will be supplied with a 36-mile radar unit, a 7½ kilowatt generator, a scuba compressor, Loran C, VHF, SSB and CB radios, a digital depth sounder and a depth recorder.

From its berth on the stern, the Shark Hunter II is simply pushed down the ramp into the water. When it's time to pack up and move on, a cable is hooked to the sub's forward eye hook and it's cranked aboard by a winch.

If Perry is the Bonwit Teller of sub makers, then the father of the sport sub is Captain George Kittredge (USN, ret.). Kittredge spent 18 years in the Navy's submarine service, made seven war patrols during World War II and commanded five different attack subs.

I couldn't believe a man who spent two decades in submarines would go into business building them when he retired, but Kittredge has a good alibi: "Military submarines don't have any port holes you can see out of—just a periscope. After being in subs all those years, I never once saw what the bottom

continued

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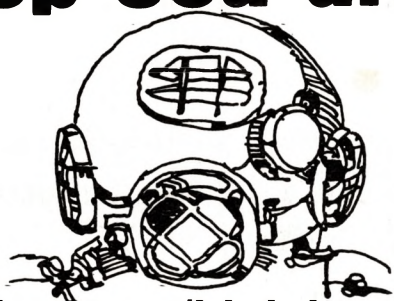
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DIVING CRAFT *continued*

looked like, so I thought it would be fun to have a little sub I could see out of."

The idea of a small sub first occurred to Kittredge while on war maneuvers in the Virgin Islands in the 50s.

"We were tied up alongside the pier in Charlotte Amalie," Kittredge said, "and there was a UDT team down there too. They came over and told me they had a British one-man sub called a Welborn which had been used during World War II. They didn't know how to operate it, so they asked me if I would try it out. It was a fine little submarine except it didn't have any variable ballast, and to keep depth control you had to run it along at about five or six knots."

Kittredge was hooked. After he retired from the Navy in 1962, he immediately began building subs. On his third attempt, he came up with a boat that sparked interest from Canadian salvage divers, and the K-250 was born.

"I had a lot of help with this," Kittredge said, "because of people I knew like Rear Admiral McKee who was head of design at General Dynamics, and from Frank Dunham. It wasn't a case of Rube Goldberging it along, I had some professional help."

Kittredge estimates he has built about 36 subs since then. About half were sold to researchers, the others to people who wanted a fun recreational vehicle. He's also sold plans for the K-250 and made-up parts to people all over the world.

"A couple of years ago I sold one to a guy in Oklahoma," Kittredge said, "I didn't know enough about Oklahoma to know why a man would want a submarine out there, but I guess they have lakes. We sold four subs in Alaska and a number in Canada."

The current K-250 is 12 feet long and will whip along at four knots. There is a large acrylic dome for the pilot, affording a 360° view. The controls are utter simplicity. Base price for the one-man K-250 is \$16,000. Power is supplied by 12-volt batteries, or a diesel-electric power plant is available as an option.

The latest entry in the sport sub market is the Underwater Propulsions Diver Delivery Vehicle. Like the Perry, it's a wet sub, requiring the occupants wear scuba. Although the DDV has been exhibited twice at the Dive Equipment Manufacturers' Association trade show, the first production model won't be delivered until this summer.

Unlike the Kittredge or the Perry, the DDV will accommodate up to four

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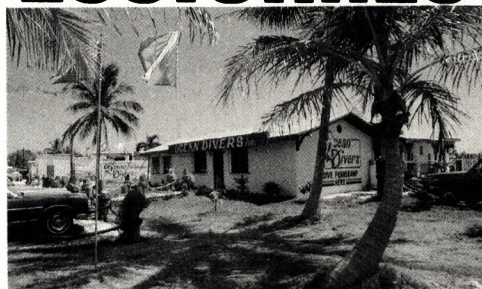
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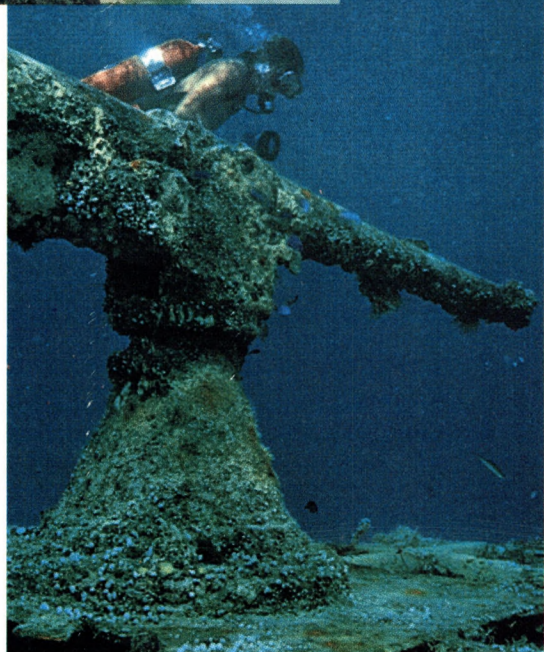
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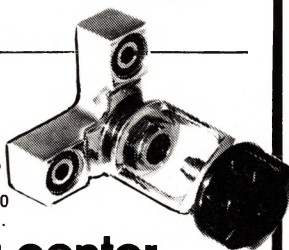
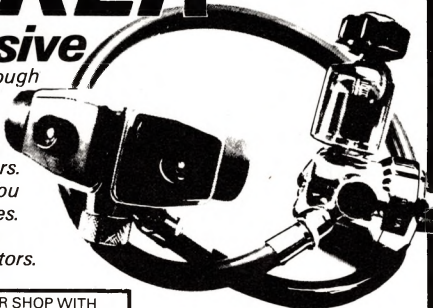
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DIVING CRAFT *continued*

passengers. Base price for a DDV is \$16,500 including instrumentation: pressure gauges for the ballast and diver air supply systems, depth gauge, thermometer, dive/climb indicator, compass and power supply indicator.

For a little bit extra, Underwater Propulsions will paint the sub any way you want it, or put on a flashy metal-flake finish. A custom trailer is available as an option.

Last year, a DDV prototype was confiscated by the FBI from one James Rose, who had purchased the craft from Underwater Propulsions. Rose also had a quantity of plastic explosives and reportedly planned to use the outfit to sabotage South American whaling ships.

Although they don't recommend their boats for such use, designer Jim Bottoms and Underwater Propulsions president Alan Grigg point out that the DDV is admirably suited for commercial diving operations.

"I feel there's enough of a sport market alone to justify our interest," said Grigg, "Obviously it's an expensive toy, but all along the coastal areas of the southern U.S., in the islands, in South America and the Mediterranean there are people who want these things just for their own use."

"Another area where there's been a lot of interest is in resort hotels in the islands. As a service to divers or for people who aren't divers, where there's some nice scenery in a stiff current area, these submarines are a natural for underwater tours."

These three subs, while the product of a lot of research and planning, are still only a short way down a very long road. Soon you may be able to step into a sport sub dockside at your favorite Caribbean haunt and take a spin across several miles of reef. And if you're a diver, you'll do it, too.

"Divers are always talking about it's a whole new world down there," George Kittredge said, "I think it's the spirit of adventure that's in all people, especially young people. If you look at the earth, two-thirds of it—or as the Navy says, 73 per cent—is covered with water. Well that's like having a four room house and we're stuck in that one land room. Originally we thought we'd build subs like the old R boats with just a few things like internal variable ballast. Now we're about up to the fleet boat stage. We don't have any plans to go nuclear, but who knows?"

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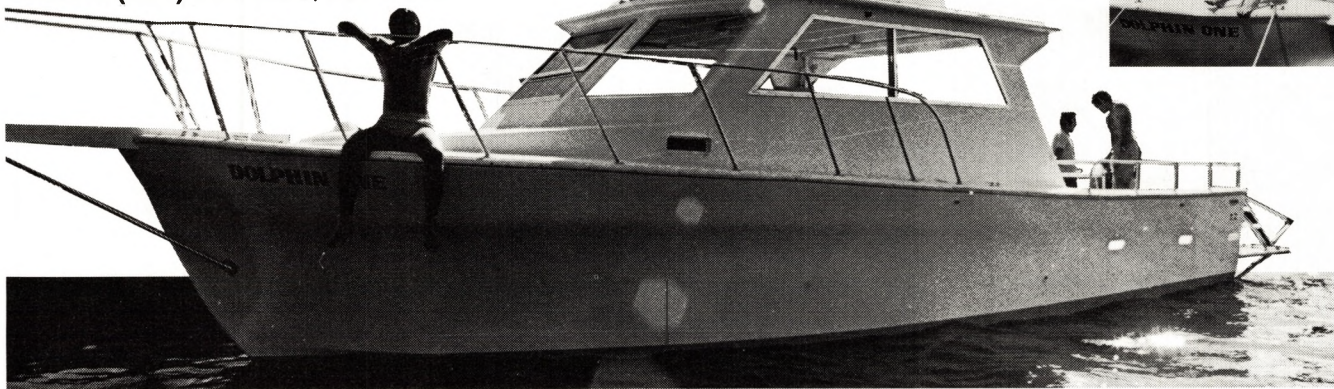
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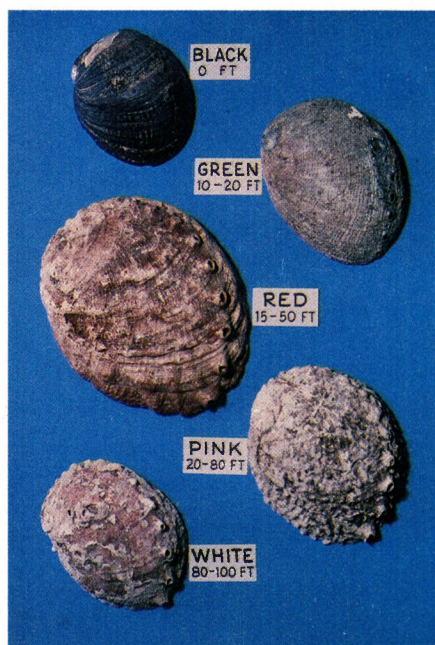
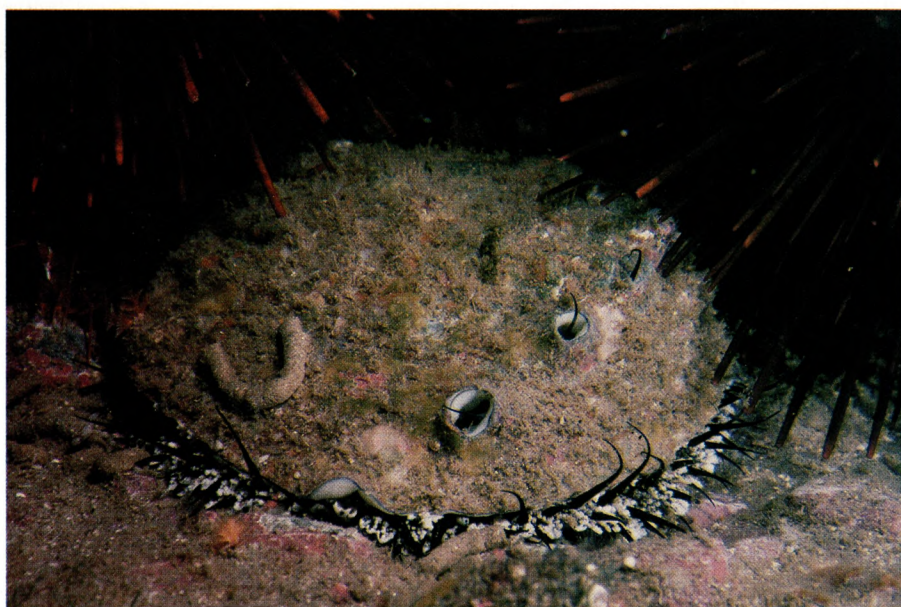
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THE EDIBLE SEA

Shellfish Steak

Prices are high and pickings are thin, but the abalone remains the most coveted of West Coast molluscs.

BY PAUL HILL



Top: A well fed, prime specimen awaits the ab iron. Tentacles visible beneath the perimeter of the shell indicate a loose grasp of the rock and a relaxed ab ready for the plucking. Above: Some of the more common species and the depths at which the largest concentrations occur.

It is called the steak of shellfish; and even at \$13 per pound, hungry West Coast gastronomes consume prodigious quantities. Divers hunting the elusive delicacy pay even more—\$20 to \$40 for a boat trip to gather their government-certified limit of four at an average half-pound each, abalones make expensive taco stuffing.

Although it is the scarcity of abalone on the market that keeps the prices up and the fishermen happy, there are, ironically, plenty of abs to go around. Widely distributed across the globe, edible species of abalone are found in North America only on the Pacific coast. In California, which has the largest ab fishery, commercial harvest is allowed only south of Point Lobos, near San Francisco. In these parts, the snails are scarce. However, north of San Francisco, the abs are thick—reportedly knee-deep in some areas.

This unequal distribution is only partly due to human intervention. Taking abs while freediving is permitted in the

northern region, and statewide, the sport fishermen take more abs than the commercial divers.

The abalone's greatest natural predator, and chief contributor to the shortage, is the sea otter. South of San Francisco hordes of otters plunder the abalone beds. Otters, decimated by fur hunters in the 19th century, are now protected by federal law and have staged a gratifying, if problematic, comeback. They are gnawing their way through the world's greatest concentration of abs. Fortunately, the otters have not yet infiltrated the northern ab beds.

Excepting the members of a few coastal Indian tribes, the otters had no competition for abalone until the arrival of Chinese laborers in the mid-19th century. The shores of Asia had been stripped of abalone years before by overfishing. The discovery of shallow intertidal areas cobbled with the thick-shelled molluscs presented a new and unexploited opportunity. The Orientals began drying abalone meat and shipping it westward. One report, dated 1912, shows 14 tons of meat shipped from Long Beach in July of that year. By 1922, the catch taken from the Monterey region alone was 1.5 million pounds.

Paul Hill is editor/publisher of Dive Industry News, and the co-author of The Edible Sea, a book considered by divers as the reference for recipes.

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EDIBLE SEA *continued*

These events did not pass unnoticed by the white majority. In 1907, Ernest "Pop" Doelter, an enterprising restaurateur, arrived in Monterey. He felt there must be a better way of eating abalone, and after some experimentation, created what remains the classic ab recipe. Fried abalone became a standard at restaurants throughout the state. Then an ordinance was passed making it unlawful to take abalone commercially in the shallow intertidal areas. Since most Chinese were not divers, their places were soon taken by Japanese and Caucasians.

Using hard-hat gear, the divers had no trouble supplying the new demand until their supply—the ab beds—began to dwindle. Restrictive measures were passed to limit catches, forcing some smaller operators out of business. Then, at the onset of World War II, many Japanese divers and American divers of Oriental descent were incarcerated in detention camps. They returned after the war to find the business, and sometimes their boats and equipment, in the hands

of white Californian entrepreneurs.

Identification

On the Pacific coast, there are eight common species of abalone. Their popular names are: red, pink, green, white (or sorenson), black, pinto, flat and threaded abalone.

Red Abalone

The red abalone is the largest species, and is easily recognized by its narrow, red, wavy rim. The lumpy outside surface is dull red but is usually covered with marine growth. The inside is pale pink and greenish, with a large muscle scar that has dark green markings. The foot and tentacles are black.

The red abalone is the most popular of all abs. They were most abundant in south central California, but heavy commercial fishing and sea otters in that area have almost depleted this species. Reds prefer rocky locations where there is considerable wave action and water exchange. Generally, they cannot be found in sheltered bays. Maximum con-



Left to right: Use a flat, blunt tool to remove the meat from the shell. Carefully cut away the head and entrails around the edges. Slice the meat into 1/4-inch-thick steaks using a very sharp knife. Tenderize the steaks by pounding them lightly with an ab hammer until they are limp; then uncork the wine and light the candles.

centration is between 20 and 50 feet, though they are found at other depths.

Pink Abalone

The pink abalone is more circular than the red, is highly arched, and is easily identified by its sharply scalloped rim. Its scientific name is *Haliotis corrugata*. The outside surface is rough with wavy convolutions, dull green to reddish brown, and is usually covered with heavy marine growth. The interior is predominantly pink with traces of green. This ab has a black foot and tentacles like the red. The pink is commercially important and is taken often by sport divers in southern California. The largest concentrations of pinks are located between 20 and 80 feet.

Green Abalone

The green ab is best identified by its interior, which is brilliantly iridescent with predominant shades of dark green and blue. The interior is considered to be the most beautiful of all abalones. The shell is oval, relatively flat, and regular in form. The outside shell is olive green to reddish brown and is usually lightly covered with algae and other marine growth. The tentacles are olive green. This ab is most usually taken by sport divers as it is relatively tough to eat and frequently harbors a parasitic worm. The largest concentrations are in 10 to 20 feet of water where there are strong currents and heavy wave action.

Black Abalone

The black is identified by its small dark blue to black shell, which hosts little or no marine growth. The inside is pearly white with pink and green reflections. The meat is small, dark, tough, and requires special treatment to tenderize. Black abs enjoy the surf and generally are found in numbers along rocky shores.

White Abalone

This ab is also known as the sorensen (*Haliotis sorenseni*). It is oval, highly arched, reddish brown exterior, and usually covered by lush marine growth and tube-dwelling molluscs. The interior usually has no muscle scar and is pearly white with pink reflections. The tentacles are green and yellowish. The muscle is yellow or orange and is so tender that it requires very little or no tenderizing. The white usually is found around 80 to 100 feet feeding on algae-covered rocks. Due to its deep water habits, this ab is not often taken nor is it very well known,

except by very experienced scuba divers.

Threaded Abalone

If you find an abalone that appears to be a cross between a white and a green, it will probably be a threaded abalone. The threaded looks like a white with a greenish or bluish rim. It is the least common ab in California.

Pinto Abalone

The pinto abalone is found in the cold water north of Point Conception. The inside of the shell is pearly white, like the black abalone. The pinto's foot is tan with green tentacles, and the muscle is as tender as the white ab. The shell seldom exceeds four inches and is irregular with a brownish rim. This ab is also called the pink or Japanese abalone.

Flat Abalone

The flat abalone has an oval, long, narrow shell that is considerably flattened. It is not taken by commercial or sport divers because its muscle is very small. Most are three to five inches in length.

Abalone Poisoning

Several species of abalones that inhabit Japanese waters have poisoned humans. These poisonings are the result of eating the viscera, where poison builds up in the liver of abalones that feed on a seaweed of the genus *Desmarestia*.

Catching an Abalone

In tranquil water, an abalone attaches itself loosely to a rock, allowing its tentacles to protrude beneath the perimeter of the shell. When alarmed, the ab will clamp down on the rock so tightly that it would be practically impossible to pry it off without breaking the shell.

To take a loosely attached ab, very quickly slide an ab iron up under the abalone at about a 15-degree angle, keeping the tip against the rock. Quickly lift up on the iron to detach the ab.

Regulations

To take an ab in California, you'll need a fishing license and a special ab iron. The California Department of Fish and Game has described the only legal ab iron. It must be less than 36 inches long, not less than 3/4-inch wide, nor less than 1/16-inch thick. All surfaces must be rounded and free of sharp edges. Knives, screwdrivers and other sharp instruments are prohibited—and wasteful.

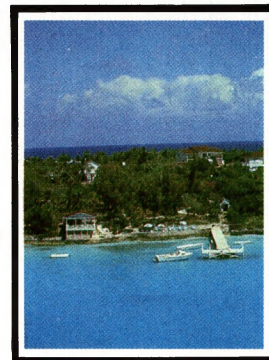
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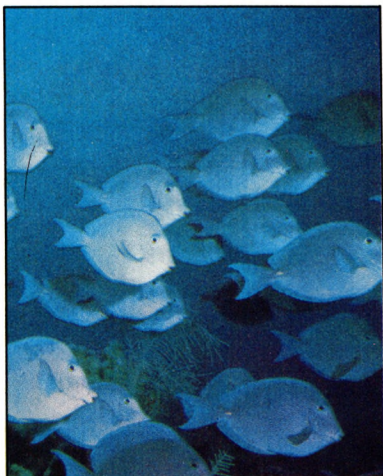
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EDIBLE SEA *continued*

undersized abs that will be replaced. An ab that is deeply cut will soon bleed to death as their blood does not clot easily.

You may take only four abs of any species and no more than eight may be possessed on any authorized multi-day trip. There are minimum sizes for each species: seven inches for red abalone; six inches for green, pink and white abalone; five inches for blacks; four inches for all other species.

Ab Tenderness

The theory is that a well-nourished, relaxed ab is a tender ab, and a tense, hungry ab is a tough one. Tender abalones are usually found in deep water where there is plenty of food and less current. Tough abalones are generally located in shallow water that is sparse in algae growth and has strong surf action.

Handling and Cleaning

Keep freshly caught abs in a burlap sack soaked in sea water, or in an ice chest. An ab will live for several days if kept cool and damp. The whole abalone, shell and all, can be kept in a freezer for six months or more if enclosed in a plastic bag to prevent evaporation.

Remove the ab from its shell with a wide, flat tool such as an ab iron, bamboo rice paddle, or a spatula about one inch wide. Insert the tool between the meat and the shell. Start where the shell is thinnest and flattest. Detach the muscle from the shell by forcing the tool under it and lifting.

To remove the entrails from the meat, cut away the tissue around the perimeter of the muscle, and remove the head with a V-shaped cut. If you want to freeze the ab at this point, there is no need to go any further. Just seal it in a plastic bag until you are ready to eat it. If your ab develops freezer burn, it will affect only the part that you will later trim off.

Finally, cut off the tentacles and all dark portions around the perimeter. Slice a thin layer off the bottom and top of the muscle. The top portion next to the shell is a little tough to eat. The cleaned ab is now ready for your favorite recipe. Save all the trimmings; they can be boiled to make a broth and snacks or minced to use in stew or chowder. For a delicious broth, cut the trimmings into small pieces and boil them in salted water for five minutes.

Abalone Steaks

With a very sharp knife, cut the abalone horizontally into 1/4-inch thick slices. To

make slicing easier, place the ab in a refrigerator with foot side down on a flat surface for several hours. Pound slices with an ab hammer very lightly, but thoroughly, to tenderize. When properly pounded, the steaks should resemble satiny, limp pancakes. Each steak is then dipped in egg beaten with water or teriyaki sauce and coated with cracker crumbs or other coatings. Fry steaks in butter and olive oil, very hot, and very fast—no longer than 30 seconds each side. A red, pink, or white ab properly fried will give you a steak tender enough to be cut easily with a fork.

Abalone Relleno

This is my favorite recipe. The original came from Mexico in 1967 without a name. My wife, Mavis, and I named it when we gave our first seafood presentation in 1969. Since then, there have been other versions—but the following is the original from Mexico.

- 1 abalone, sliced into steaks and pounded
- 1 medium can of whole Ortega chilis
- 1/2 pound Monterey jack cheese, grated
- 2 eggs, beaten with 2 tablespoons teriyaki sauce
- 1 small bag Fritos, crushed to fine crumbs
- 1 small box Ritz crackers, crushed to fine crumbs
- butter and oil (equal parts) for frying
- salt, pepper

Prepare abs. Cut each Ortega chili down one side and scrape out seeds. Leave the seeds in if you want it a little hot. Lay one opened chili over each abalone steak, then sprinkle each generously with cheese. Roll up the steak with the chili and cheese inside and fasten with a toothpick. Dip each roll in the egg mixture. Roll in crumb mixture of Fritos, Ritz cracker crumbs, salt, and pepper. Coat each roll well. Fry rolls about 30 seconds on each side in butter and oil mixture 1/4-inch deep. Drain on absorbent paper and serve. One whole ab usually serves two to four people.

Abalone Roast

This one will surprise you in that the finished product tastes much like roast beef! This is an Oriental method of preparing abalone and is easy and different. Simmer abalone in 2 cups water mixed with 1/2 cup salt for one hour with the lid on. Drain, place in baking pan and bake for 20 minutes at 250°F. Refrigerate to chill. Slice vertically very thin to serve and eat like beef jerky.

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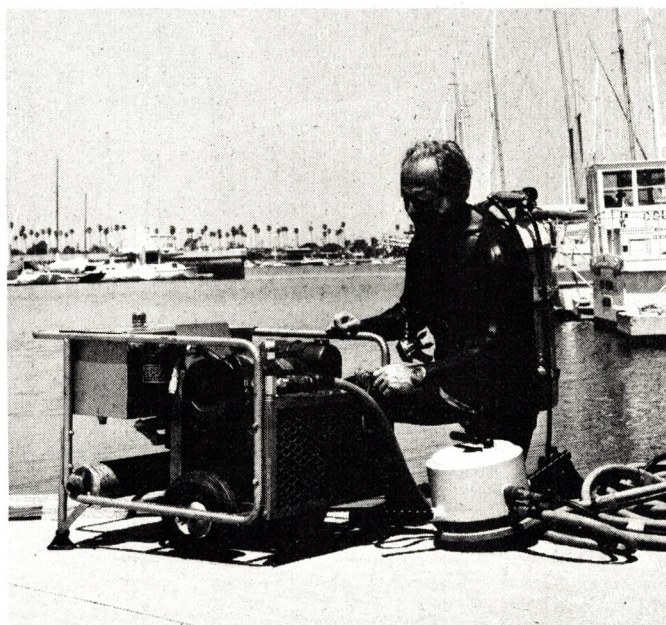
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WORKING DIVER

Talking With Dolphins

Results haven't reached the level of conversation, but these researchers have a leg up on some stiff scientific competition.

BY YVETTE CARDOZO
PHOTOGRAPHY BY
PAT CANOVA

The green murk has all the visibility of split pea soup, and at a depth of 20 feet I've already forgotten which way is up. In the dim silence I become aware of a noise, more felt than heard at first, then escalating to a high-pitched, eerie drone. It comes closer; the sound of air being squeezed from the pinched neck of a plastic balloon. Suddenly it is inches from my nose, a huge form bursting out of the gloom, stopping so suddenly I'm almost propelled backward by its backwash. I can't see beyond the massive grinning face. I'm being studied from head to toe.

Hanging there returning that curious stare, I have to wonder what's going on in the brain behind those almond eyes. If I am ever to find out, it will be through the efforts of researchers such as Mandy Rodriguez, Carol Smith and Ron Reisman. Working between tourist shows at the Flipper Sea School in the Florida keys, the trio has spent the past year experimenting with the faint beginnings of communications between dolphin and man.

Sitting crosslegged on the end of a narrow wooden dock, Rodriguez reaches for his tools—a clipboard and a bucket of fish. He calls to Natua, a male dolphin born here four years ago. "Nat, show

*Yvette Cardozo is a freelance writer and travel buff. Her latest work appeared in **Tropic and Aloft**.*



Above: Students Natua and Misty compete for the photographer's attention at Flipper's Sea School of Delphinid Research in Grassy Key, Florida. Left: Researcher Carol Smith takes a training break to swim with friend Natua. Facing page: Communicating with whistles, Mandy Rodriguez and Misty practice new commands. The researchers have so far built a 50-word working vocabulary based on whistle pitch and duration.

me tail. Nat, snout. Nat, fluke." But Rodriguez is whistling, not speaking. Each undulating trill has a meaning as clear to Natua as spoken English is to us.

At the end of the session Rodriguez strokes Nat's head. "That was good, Nat, but you know you can do better." Although today's response ratio of 15 out of 23 commands correctly interpreted is good, there have been days when Nat and his three companions have responded correctly to every command.

Rodriguez and his colleagues weren't the first to study dolphin communications, but their research differs from previous efforts in an important respect: None of the three is a trained

researcher with academic credentials. As a result, their approach is oriented more toward the practical than the theoretical, and the gains they have made in just a year of research are impressive by anyone's standards. Reisman studied classical Greek and helped in an early project with chimpanzee communications. Rodriguez has worked with dolphins for ten years and has taught sign language to his deaf dog. Smith was a secretary. But in a field of study as uncharted as dolphin research, the experience they've gained in the water with the mammals has proved more valuable than a string of diplomas.

"We're not trying to make the dol-

phins speak English. That's impossible, as they have no vocal cords," Reisman explained. Nor can humans expect to reproduce the high frequency clicks of dolphins. But both can whistle, and on that common ground the researchers have built a vocabulary based on whistle pitch and duration. "Come" is three short blasts. "Fish" is an undulating warble that sounds like a kid calling his dog. "Touch" is a descending slide, like an imitation bomb falling to earth.

To demonstrate, Reisman whistled a sentence that translated as "Misty, flipper touch ball." Misty obeyed. This word order sounds strange in English, but Reisman says their research has shown it makes more sense to the dolphins to specify name and body part first, then give the command.

After a year of work, the four dolphins can recognize about 50 words, and have independently used at least

Reisman and Smith are more than pleased with their accomplishments.

Despite, or perhaps because of, their intelligence, dolphins can be truculent students. Like young children, their attention span is short. They can get peevish, and distractions are inevitable. Workmen repairing a pool, unsettled weather or even the illness of a fellow dolphin can create an uncooperative attitude. On one occasion Rodriguez tried to demonstrate Natua's response to simple English commands, but a coming cold front had the dolphin preoccupied. When asked to dive, Natua turned his back, lifted his tail into the air and wagged it. "That," Rodriguez explained, "is Nat's way of giving me the finger."

On days like this training sessions last no more than ten minutes. Better days include two hour-long sessions, usually involving some work with new commands and a good deal of simple



two. Once, Rodriguez was standing by the training pools when Misty swam deliberately to her dock and whistled three short notes: Come. Hardly believing what he'd heard, Rodriguez rushed to obey. When he reached Misty's dock, she repeated the call, obviously pleased that she had Rodriguez so well trained. Natua's favorite word is fish, one he uses often and to advantage.

Teaching a communicable vocabulary to dolphins is a painstaking task involving endless repetition and rewards of fish each time one of the mammals reproduces the right combination of pitch, duration and pattern. Still, progress has been steady, and after a year Rodriguez,

play. Falling out of a rubber raft, Rodriguez or Smith swim to the bottom, moving slowly while the four dolphins sprint circles around them, showing off their superior agility.

The work in progress is an extension of informal, unstructured study Rodriguez has conducted for years on his own time. Two years ago the Sea School's new owners indicated their interest in developing more than simple circus tricks for tourist consumption, and regular research sessions were scheduled. A mobile video facility was set up, and a battery of audio recorders, sound analyzers and small computers grew to meet basic research needs.

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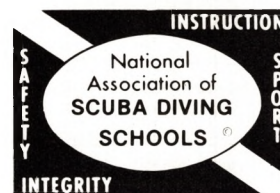
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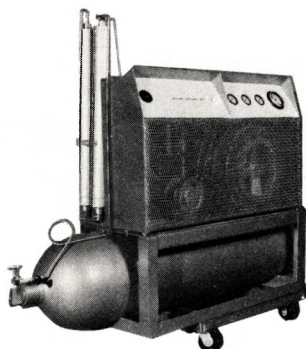
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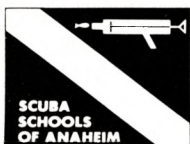
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WORKING DIVER *continued*

Progress quickly outstripped equipment capabilities, and Reisman is enthusiastic about the sophisticated gear they hope eventually to utilize. One device already in the works is an underwater response mechanism that a dolphin could manipulate by pressing a sequence of pedals, each corresponding to a vocabulary word or idea.

"They're like children," Rodriguez explained. "You have to make the work fun; you have to grab their attention by changing the way you stand, by using new objects, by varying the commands."

This idea of challenge is an important part of dolphin psychology. Seventeen dolphins live in the training pools here. All that separates them from the ocean is a single fence of chicken wire stretching from ocean bottom to the water's surface. Obviously they can easily escape, and half a dozen have. But not by jumping the fence, which they could easily do. In every case they've taken the trouble to seek a weak spot in the fence, push the strands of wire aside and worry a hole large enough to wriggle through. And every time they've returned.

And as they share man's curiosity and love of challenge, dolphins' legendary sense of humor seems also to somehow mirror our own. Misty's favorite trick with Smith is playing hard to get. Refusing to obey command after command, Misty will ignore Smith until she stands up and walks away, tossing a ring into the pool one last time with a shrug. And sure enough, here will come Misty with the ring on her nose.

It is this kind of intelligent, sometimes moody and emotional behavior, which makes working with dolphins so exciting to Rodriguez, Reisman and Smith. "Dolphins are so alien from humans, both physically and from an evolutionary standpoint," Rodriguez says. "They live in water. They don't share our world at all. But we have so much in common with them, mentally and emotionally."

Smith admits she gets goosebumps when some concept she's teaching catches hold and the gleam of recognition shows in a dolphin's eyes. "Their power of reasoning boggles the mind. When that eye is looking at you, it's for a reason—sometimes happy, sometimes sad. But whatever the mood, the power of reasoning behind it is apparent.

"And you finally realize, this animal is aware, rational, intelligent—it's just a person in a gray skin with fins." ☺

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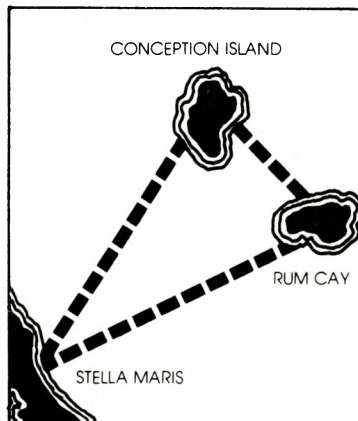
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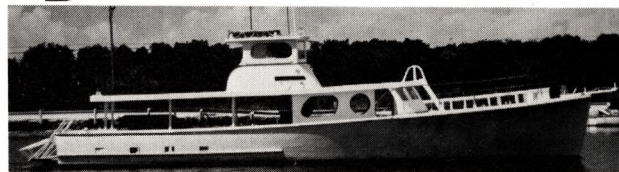
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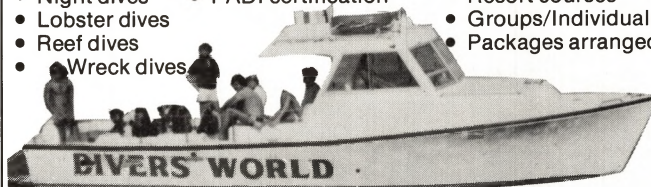
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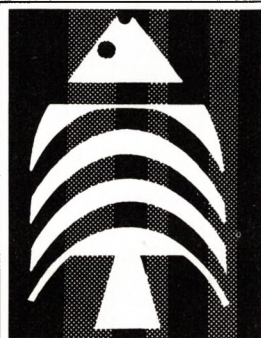
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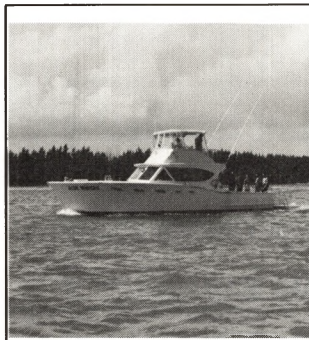
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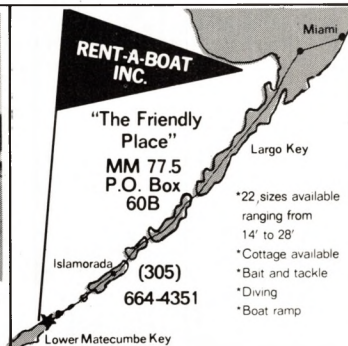


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Inform divers about where you cruise, what types of diving are available, accommodations offered on your vessel and how to book charters.

For more information on this section write or call:

Jonathan Blumenfeld
SPORT DIVER Magazine
444 Brickell Ave., Suite 250
Miami, FL 33131
(305) 358-0100

Norman Hamilton
SPORT DIVER Magazine
444 Brickell Ave., Suite 251
Miami, FL 33131
(305) 358-0517

RESORT GUIDE U.S. VIRGIN ISLANDS

BOLONGO BAY BEACH & TENNIS CLUB/ OCEAN ADVENTURES— ST. THOMAS, U.S. VIRGIN ISLANDS

P.O. Box 7337, St. Thomas, USVI 00801. (809) 775-1800

RESERVATIONS: Bolongo Bay Beach & Tennis Club c/o Dick Doumeng, P.O. Box 7337, St. Thomas, USVI 00801. (809) 775-1800 or toll free (800) 223-5695 (except NY (212) 730-8100).

LOCATION—Club is situated on 10 acres of property on southeast side of island on beach. 3 miles from downtown and 10 minutes from airport.

TRANSPORTATION—Air: Air Florida, American, Delta, Eastern from Miami. Charters: several airlines available from San Juan. Ground: taxi from airport \$4.50, major car rentals at airport.

ACCOMMODATIONS—Thirty-seven room deluxe resort with 800' of private beach. Rooms are all air conditioned with private bath, freshwater shower, some with kitchen facilities, balcony and radios. Resort has four tennis courts, pier, dive store and freshwater pool. Restaurant, lounge/bar with nightly entertainment. Rates: single \$48, double \$52, summer, \$84 winter. Major credit cards accepted.

DIVING AVAILABLE—

Shallow reef (5'-33') **yes**

Mid reef (33'-66') **yes**

Deep reef (66'-99') **yes**

Walls **no**

Wrecks **yes**

Caverns **yes**

Drift dives **no**

Night dives **yes**

Beach dives **yes**

DIVING EQUIPMENT—2 Worthington compressors, 3000 PSI. 80-72 cu. ft. tanks. 2 boats include new Lindsey 43' and Dusky 32' with total diver capacity of 38. Full service retail sales and complete line of rental gear. Tank, bac pac, weight belt, regulator, BC, mask/snorkel and fins included in dive rate. U/W camera \$25/day.

DIVING SERVICES—NAUI, PADI affiliation. 4 instructors and 2 dive-masters with CPR training. Resort course \$25, full certification \$175, advanced training \$75-300, U/W photo, bottle hunting and specialty courses available. Cost/half day diving \$25 for 2 tanks, full day diving \$50 for 3 tanks, night dive \$35 beach, \$40 boat.

DIVING PACKAGES—Special package price available through St. Thomas Diving Club. Includes accommodations, 18 dives, airport transfers, equipment (based on double occupancy).

bolongo bay
BEACH AND TENNIS CLUB



Wreck of the Rhone
1867 The site for the filming of the movie "The Deep" Photo Armando Jenik



PRO DIVE STORE DIRECTORY

The Pro Dive Stores below are listed by state, then alphabetically by cities and store name within each city. To advertise your professional services in the directory, send \$80 check or money order, with listing information to Pro Dive Store Directory, c/o Norman Hamilton, 444 Brickell Ave., Suite 250, Miami, Florida 33131. Prepayment will expedite materials and assure your listing. Tell divers where you are, what you offer, and that you want to do business with them—list your facilities in the Pro Dive Store Directory.

ALASKA

Alaska Aquatic Dive Center

NASDS Inst.-Full Svc. Scubapro Shop-Air-Rentals-2 man chamber-Hydro & Tumble-Boat Trips-Catalog SIs-C card required. 503 Water St. Ketchikan, Alaska 99901 (907) 225-5020, 225-DEEP

ARIZONA

Scuba Sciences, Inc.

Arizona's most active dive Center-NASDS 8502 N. Black Canyon Hwy., PHX, AZ 85021 (602) 995-5926 or (602) 275-1221 616 S. Myrtle, Tempe, AZ 85281

Aqua Sports, Inc.

First pro dive shop in Arizona. Original owners since 1955. 4230 E. Indian School Rd., Phoenix, AZ (602) 955-4120

ARKANSAS

Scuba Hut-Sportsco

Custom Screening & Transfers-Shirts-Instruction-Air-Rental-Boats 1115 S. Hwy. 71, Springdale, AR 72764 (501) 751-0636

CALIFORNIA

California Skin Diving School

1083 N. Harbor Blvd., Anaheim, CA 92801 (714) 991-DIVE; 9762 Magnolia, Riverside, CA 92503 (714) 689-2422; 1173 N.E. St., San Bernadino, CA 92410 (714) 885-1416; 4420 Holt Blvd., Montclair, CA 91763

Scuba Schools of Anaheim/Long Beach

Oceanside Classes-Equipment Sales-Repair-Rental. 1640 W. Lincoln, Anaheim 92801; (714) 956-5540; 4740 P/C Hwy., Long Beach 90804; (213) 433-6765; 129 South Hill, Oceanside 92054; (714) 722-2455

Aqua-Ventures Diving School

PADI 5 Star training facility. All major brands. Complete professional in-house repair. Tour Channel Islands. Open 7 days. 3000 psi-Sales-Rentals-U/W Photography. 2172 Pickwick Drive, Camarillo, CA 93010 (805) 484-1594

Sea to Sea Scuba School

NAUI-PADI-YMCA Instruction, all levels-Sales-Repairs-Rentals-Travel Pkgs.-Air 10950 S. Mt. Vernon, Colton, CA 92324 (714) 825-2502

Divers Corner

11200 Old River School RD. Downey, CA 90241 (213) 927-1417

Ocean Sports, Ltd.

NAUI-PADI-Sales-Rentals-Repairs-3000 psi-Air-Trips. 16446 Bolsa Chica, Huntington Beach, CA 92649 (714) 840-4840

Laguna Sea Sports

925 N. Coast Hwy., Laguna Beach (714) 494-6965; 1951 Newport Blvd., Costa Mesa (714) 645-5820; 7066 Van Nuys Blvd., Van Nuys (213) 787-7066; 18503 Hawthorne Blvd., Torrance (213) 542-8609; 3335 Motor Ave., W. Los Angeles (213) 559-7771

New England Divers, Inc.

Open 7 Days-NAUI-PADI Certification 11830 W. Pico, Los Angeles, CA (213) 477-5021; 3860 Rosecrans, San Diego, CA (714) 298-0531; 8363 Center Dr., La Mesa, CA (714) 462-4570

Aquarius Monterey

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Newport Pro Watersports

PADI-NAUI Instruction-Sales Service-Repairs-Diving Tours-3000 psi Air Service Avon Boats 1220 W. Coast Hwy., Newport Bch., CA 92663

Divers Down—San Fernando Valley

Complete Instruction-Htd. Pool-Dive Trips-Open Water Certification-Equip. Sales-Rentals 6742 Reseda Blvd., Reseda CA 91335 (213) 342-1212

Scuba Duba Dive

12538 Ventura Blvd., Studio City, CA 91604 (213) 761-7833; 7126 Reseda Blvd., Reseda, CA 91335 (213) 881-4545

Wallin Dive Store

U/W Photo Specialists-Instruction-Rentals-Air-Repairs-Travel-Marine Art-Books-Jewelry 1656/58 El Camino Real, San Carlos, CA 94070 (415) 592-7606

The Underwater Experience, Inc.

Gateway to Channel Islands Diving-Sales-Rentals-Inst.-Air-Charter boat dives. 824 Thousand Oaks Blvd., Thousand Oaks, CA 91360 (213) 991-4151; (805) 497-0855

CONNECTICUT

Orbit Marine Sports Center

NAUI-PADI Instruction-Sales-Rentals-Air Trips-Hydro-Visual Insp. 3273 Fairfield Ave. (203) 333-DIVE

The Diving Bell

Sales-Rentals-Repairs-Air-Hydrotest-Open all year-Certified Instruction. Dive Lake Candlewood. Rt #7, Rd. 5, Brookfield, CT 06804. (203) 775-3573

Aqua Sports, Inc.

Air Station-Instruction-Service-Tank Testing & Cleaning-Salvage-Repairs. Victor G. Worst & Phyllis C. Tetrault, Rt. 12 & Long Cove Rd., Gales Ferry, CT 06335. (203) 464-7878

Will Jacobs Dive Shop

Sales-Service-Rentals-Hydro-Instruction. 1153 New Britain Ave. W., Hartford, CT 06110. (203) 232-8719.

Jack's Dive Center

Sales-Service-Instruction-Rentals-5000 psi Air-Trips-Photography & Commercial Equip-AGA Divator. Rt. 10, Plainville, CT 06062 (203) 747-3170

The Scuba Shoppe/Recreation Unlimited

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FLORIDA

Underseas Inc.

Key's largest pro dive shop-Daily half & full day reef trips to Looe Key-Charter to Cay Sal Bank, BA-Sales-Repairs-Rentals-All major credit cards. P.O. Box 319, MM 31, Big Pine Key, FL 33043 (305) 872-2700; 872-9555

Nautilus Dive, Surf & Ski

Open 7 days a week. Rentals-Air-Instruction-Trips-Repairs. 877 E. Palmetto Park Rd., Boca Raton, FL 33432. (305) 368-0555

Florida Divers Service, Inc.

Dive boat Bottoms Up-Reef trips-Air-Pro Shop. 2280 N. Fed. Hwy., Boynton Beach, FL 33435 (305) 737-7240

Gulfview Divers Headquarters

Air-Rentals-Sales-Underwater Photography-Hydro testing-Pool on premises-Dive trips-PADI Inst. 101 Bridge St. Bradenton Beach, FL 33510. (813) 778-3735

Mileo Photo Supply (305) 446-0855

2105 Ponce de Leon Blvd. Coral Gables, FL 33134. Nikonos-Subsea-Ikelite-Sunpak Marine-Pentax. Dealer inquiries invited. FL WATS (800) 432-2384. Your U/W Photo Equipment Specialist.

Charlotte Diver

Sales-Service-Rentals-Lessons-Air 861 S.E. Tamiami Trail, Charlotte Harbor, FL 33950. (813) 629-2722

Herb's Dive Shop

Reef Trips-Scuba Tours 2434 S. Atlantic Ave., Daytona Bch., FL 32018 (904) 253-7221

Professional Diving Schools of Florida

Daily diving trips and private charters-PADI 210 N. Federal Hwy., Deerfield, FL. 1540 N. Federal Hwy., Pompano, FL. Bahia Mar Yachting Center, Ft. Lauderdale, FL. Call (305) 761-3414

Divers Haven

Sales-Instruction-Service-NASDS instruction Air-Charter for groups-U/W photo. 1530 Cordova Rd., Ft. Lauderdale, FL 33316 (305) 524-2112

Lauderdale Diver

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1008 Seaway Dr., Fort Pierce, FL 33450
(305) 465-0614

Allen's Aquatic & Trail Center

Sales-Service-Inst.-Air-Scubapro-Dacor-U.S.
Divers-Farallon-Ikelite-Bayley.
3448 W. University Ave., Gainesville, FL 32607
(904) 373-9233

Tarpoon Diving Center-Kevorkian, Inc.

Speargun specialists, Mfrs. of rubber slings,
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service. 3200 Palm Ave., Hialeah, FL 33012
(305) 887-8726

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Beautiful diving year round-6 crystal clear
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4231 Hollywood Blvd., Hollywood, FL 33316
(305) 981-0156

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MM 84½, Islamorada, FL 33036

Holiday Isle Dive Center & Resort

Reef trips-Air-Rentals-Beautiful resort and
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Hwy., Box 482SP, Islamorada, FL 33036

The Scuba Shack

Rentals-Air-Instructions-Trips-Repairs
2485 N.E. Dixie Ave., Jensen Beach, FL 33457
(305) 334-8808

American Diving Headquarters

Charters to Pennekamp Park-Air Retail-
Whsl.-Rentals-Motor Reserv's.-NASDS-
NAUI Inst. MM 106, Rt. #1, Box 274-B,
Key Largo, FL 33037. (305) 451-0037

Bill Crawford's Tropic Isle Dive Shop

Reef Trips-Air 5000-Rentals-PADI Inst. Dive
Pennekamp. P.O. Box 755, Key Largo, FL
33037. (305) 451-1063

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First dive facility in Pennekamp Park-Daily
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Largo, FL 33037. (305) 451-3020

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Super dive with Capt. Bob Klein. Cay Sal
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FL 33037. (305) 451-2121

Key Largo Diving Headquarters

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(305) 451-0286

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24 hr. Film Processing-Commercial
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33037. (305) 451-3737

Sundivers Station

Pennekamp reef trips-Instruction-U/W photo-
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Located at Deep 6 Marina, MM 104.
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(305) 451-0676

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17', 19', 21' Dive Boat Rentals-Small group
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Repair-Air-Hydros
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33040. (305) 294-4248

Capt. Franco's Reef Raiders Dive Shop

2 Daily reef trips-Dry Tortugas charter.
109 Duval Street, Downtown Key West,
MM4½, Stock Island, Key West, FL
(305) 294-3635; (305) 294-0660

Key West Pro Dive Shop, Inc.

"Key West's Oldest Dive Shop"
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Palm Beach diving at its best. Palm Beach's
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Custom Spring Steel Shafts-Machine Shop
Pro Spearfishing and Collecting
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20 passenger Coast Guard approved diving
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32804. (305) 425-8811

Diver's Den

NAUI-PADI-YMCA Inst.-Dacor-Air 3500
psi-Trips-Rentals-Sales-Service. 4700 E.
Hwy. 98, Box 10606, Panama City, FL 32401
(904) 769-1321

Pro Divers Shop

NAUI-PADI-Instruction-Air Station 400 PSI-
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Vortex Springs

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Florida Scuba Diving Institute, Inc.

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Sub-Aqua Specialties

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HAWAII

Aloha Dive Shop

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Retail Sales-Service-Air-Rentals-Charter-Boat & Shore Dives-Inst. Koko Marina, Hawaii Kai, HI 96825. (808) 395-5922

South Seas Aquatics

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Honolulu, Hawaii 96814. (808) 538-3854

Aaron's Dive Shop, Inc.

Plane work-Charter-U/W Scooters-Shelling-Our guides capture your dive on film-NASDS-Full Service Store-Instruction. 39 Maluniu Ave., Kailua, HI 96734 (808) 261-1211

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ILLINOIS

Academy Aqua Sports Dist. Ltd.

Air-Sales-Service-Instruction
2838 Chicago Rd., S. Chicago Hts., IL 60411 (312) 756-4334

Underseas Scuba Center

Sales-Service-Instruction-Trips
226 South Main St., Lombard, IL 60148 (312) 629-2534

Midwest Diving Specialists, Inc.

Dacor-Global-Ikelite-Imperial-Poseidon-White Stag-PADI Instr.-Air. 203 S. Linden, Normal, IL 61761. (309) 452-0222

Anchor In Scuba Center

All major brands diving equipment-Underwater Photography-Sales-Instruction
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INDIANA

Aqua Pro Scuba Center

51400 US 31 North, South Bend, IN 46637 (219) 272-8607

IOWA

University of North Iowa

Scuba Instruction-Glen Henry. 3321 Boulder Drive, Cedar Falls, Iowa 50613

KANSAS

Topeka Dive Shop

NAUI-PADI-Air-Tours
Stauky Marina on Beaver Lake Arkansas.
1425 Lane, Topeka, Kansas 66604 (913) 357-4895

KENTUCKY

Lexington Dive Shop, Inc.

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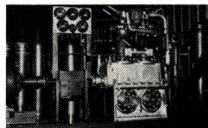
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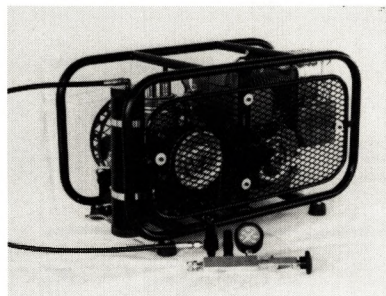
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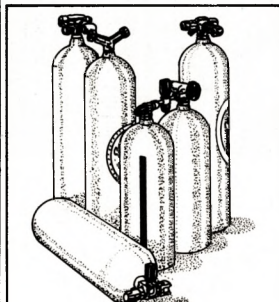
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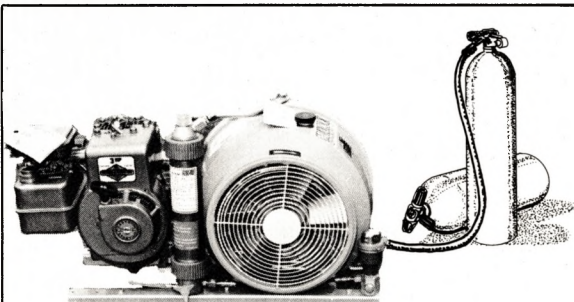


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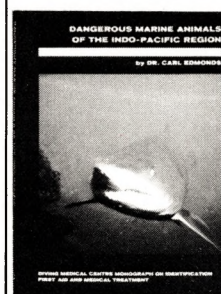
**Cayman—
 Underwater
 Paradise**

Paul Humann, Feodor Pitcairn; Reef Dwellers Press; Softbound; 96 pages; 1979; \$12.95

As operator and captain of the *M/V Cayman Diver*, Paul Humann has lived in and dived the Cayman Islands for the last six years. His text both introduces and sums up the Cayman diving experience—deep walls and lush coral gardens.

Humann's photographs, and those of well-known wildlife photographer Feo Pitcairn, illustrate the objects of his affection. Seventy-three large color photographs depict the wall, shallow reefs and reef creatures. It seems little has been skimmed over or left out; a six-foot-plus jewfish, dragon-like blennies, six-by-eight foot sponges, translucent squid, swarming sergeant-majors. Still, the text points out, there are other things to be seen in Cayman, oddities like the *Photoblepheron*, or flashlight fish, first found alive in the Caribbean by Humann several years ago.

The book identifies and describes a number of specific dive areas in the Cayman Islands: Grand Cayman, Little Cayman and Cayman Brac. It also details some of the seldom-visited, semi-secret spots located by Humann during his years aboard the *Cayman Diver*. Although the book's aim is not definitive, it does manage to succinctly convey the essence of Cayman diving.



**Dangerous
 Marine Animals
 of the Indo-
 Pacific Region**

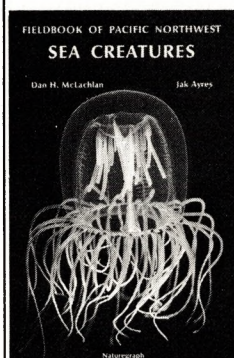
Dr. Carl Edmonds; Wedneil Publications; Softbound; 227 pages; 1978

Dr. Edmonds is commander of the Royal Australian School of Underwater Medicine. His book is written for the diver and for

medical personnel who may be called on to treat injuries inflicted by marine organism. Sections cover known predators (sharks, eels), venomous fish (lionfish, stonefish), jellyfish, miscellaneous (blue-ringed octopus, cone shell) and species which are poisonous to eat. Other chapters deal with species identification, photographs of the organisms, description of habits and habitats, method of inflicting injury, effects of injury, immediate first aid by non-professionals and a guide to subsequent management by physicians.

The scope of Edmonds' treatment is definitive. It takes in the obvious hazards—sharks and sea snakes—and the less obvious—puncture wounds from catfish, fire coral stings and poisoning caused by eating sea cucumbers.

Many of the creatures described are not found in North American or Caribbean waters but most of the venomous species of our coastal waters are discussed.



Fieldbook of Pacific Northwest Sea Creatures

Dan H. McLachlan and Jak Ayres; Naturegraph; Softbound; 208 pages; \$10

"Dedicated to our families, our friends, and to the preservation of the oceans," reads the intro to this field guide. In an easy to follow, compact style, the handbook details more than 200 marine animals found in the Pacific Northwest, one of the richest inland bodies of salt water in the world.

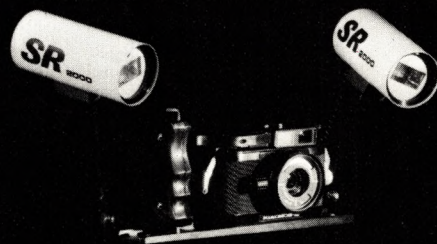
Animals are grouped in order of complexity from the most simple (sponges) through clams and crabs to the most complex (wolfel). Color photographs of each animal in its natural habitat aid in identification along with a brief biography of the creature, color, size and tidal zones in which it can be found.

Writer/photographer McLachlan and marine biologist Ayres call their joint effort a family album of the Pacific Northwest marine life. As conservationists, their underlying message is the importance of the survival of this marine life and the care we must take when studying them.

The fieldbook also contains a field key, glossary and list of references. It is an excellent guide for divers, swimmers and tidal-pool gazers in the waters from Alaska to Point Conception in southern California.

continued

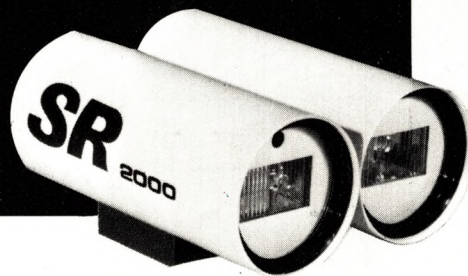
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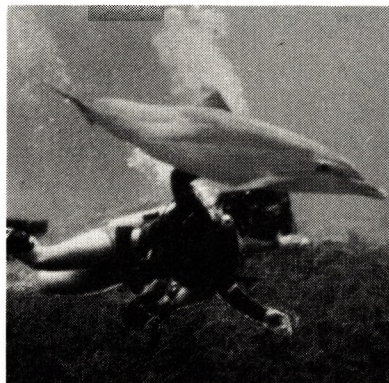
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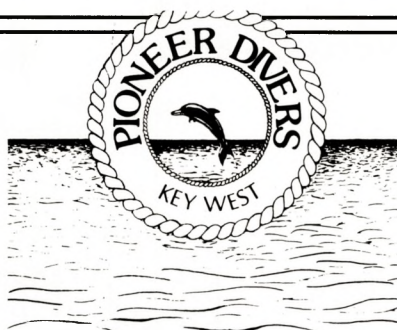
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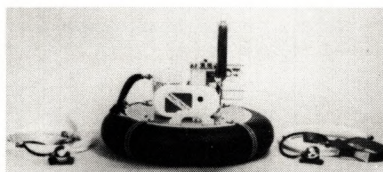
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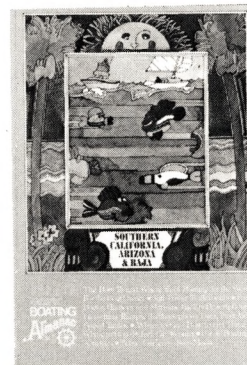
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REVIEWS continued



1979 Pacific
Boating
Almanac

Western Magazine Enterprises, Inc.; Softbound;
400 pages; \$5.95

The A-Z's of boating in and around the Pacific states are here in the yearly boating almanac. Published in three area editions, this book, featuring Southern California, Arizona and Baja, covers docks, harbors, marinas, ramps, first aid, speed tables, tide tables and places to refuel, get repairs and how to get there.

Charts, photographs and drawings detail the lakes, islands, harbors and marinas boaters may encounter in their wanderings. A variety of features include cloud patterns, star identification, angling tips, fishermen's knots, communication at sea, metric tables, and various distance tables useful for seamen and sailors. This handy guide would be a useful addition to any West Coast water traveler's library.



Gadney's Guide to 1800 International Contests, Festivals & Grants

Alan Gadney; Festival Publications; Softbound;
578 pages; price: NA

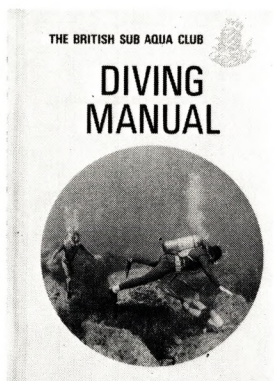
While winning 48 film festival awards for writing, directing, editing and co-producing a one-hour feature, *West Texas*, Alan Gadney amassed enormous quantities of festival knowledge. He has assembled this information, into a single reference source for all areas of the media including film and video, photography, TV-radio broadcasts, writing, poetry, playwriting and journalism.

The hefty book lists all imaginable contests, film festivals, events, grants, scholarships and internships. Data essential for entering these competitions such as rules

and regulations, requirements, judging and prizes, is also included.

Underwater photographers have their own section with more than ten contests to enter or possible entries in the numerous photography competitions.

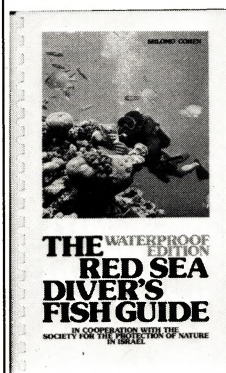
The British Sub Aqua Club Diving Manual



British Sub Aqua Club; Softbound; 573 pages; Price: NA

This complete guide to diving compiles the experience and knowledge of 25 years of amateur diving to make diving "interesting, happy and safe." Used by the British Sub Aqua Club as a textbook for diving classes, it includes chapters on the basics (physical aspects, medical equipment and training) as well as lifesaving techniques and ways to earn money from your diving adventures.

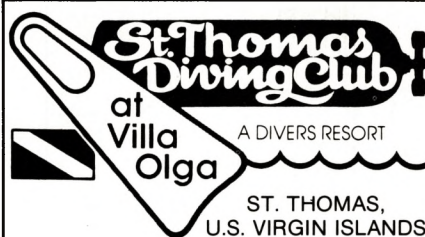
This comprehensive manual is not intended, as the editor notes, to be used solely in learning how to dive. It does offer a thorough guide to understanding the physics, techniques and safety measures needed to insure safe, recreational diving.



The Red Sea Diver's Fish Guide

Shlomo Cohen; Waterproof Edition; Seapen Books; 78 pages; 1979; \$9.95

This new fish guide is fully submersible. The major species of the Red Sea are identified by photograph; named (both common and scientific name) and described. The format should make the book easy to use in the water—large photographs, one fish to a page, large type and simplified line drawings for each fish described.



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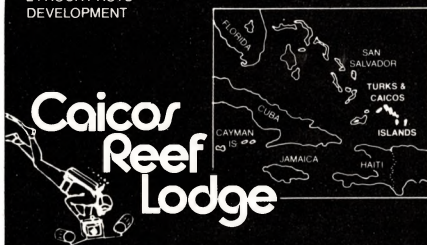
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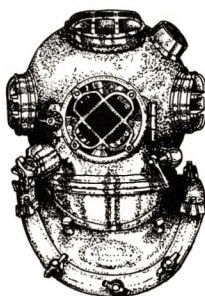
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CALENDAR

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1 Marine Wilderness Photo Contest

The Marine Wilderness Society Photography Competition is accepting entries until September 1. Transparencies and b/w or color prints will be judged in categories including birds of the sea, marine mammals, coral jungles, coastal wetlands, between tides and the open ocean. Three awards will be given in each category and a \$100 savings bond will be awarded for each of two "best of show" photographs. The competition is open to all amateurs. For entry forms, send a self addressed, stamped envelope to the Marine Wilderness Society, P.O. Box 943, Miami, FL 33165.

1 PADI Photography Competition

The Professional Association of Diving Instructors will sponsor the 1979 Underwater Photography Search/Competition from July 1 through October 31. Winning amateur transparencies and b/w or color prints will be published in the PADI *Undersea Journal* and will be displayed at the California Underwater Photo Expo in March, 1980. Participating PADI facilities will offer prizes for local competition and ten regional winners. The Grand Prize winner, to be announced at the Photo Expo, will receive an expense paid dive trip to San Salvador Island. Consult local PADI facilities, or write Al Hornsby, PADI Training Facility Director, 2064 N. Bush St., Santa Ana, CA 92706.

7-20 Teacher Workshop in the Keys

Newfound Harbor Marine Institute in Big Pine Key, Florida, offers a 14-day workshop in environmental education and tropical marine ecology. Three college credits or six Continuing Education Units will be awarded for the program. Florida teachers can earn 60 staff development credits. The \$295 package includes registration, materials, instruction, boat and lab fees, and lunch for 12 program days. Contact Bill Becker, Newfound Harbor Marine Institute, Big Pine Key, FL 33043.

9-14 Key West YMCA Photo Course

A week-long course in underwater photography will be offered by the YMCA Underwater Activities Program in Key West, Florida. The program will consist of two courses covering basic techniques and instructor level training. Both include daily photo expeditions to Key West reefs and wrecks. The four-day basic course July 9-12 will cover equipment, optics, light, technique and slide processing. A two-day instructor course July 13-14 will emphasize the theory of participatory

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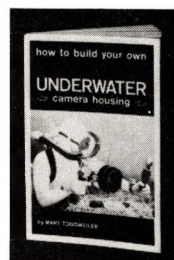
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learning, slide processing, audio-visual presentations and marketing concepts. Participants must be at least 18 years old and must be certified by a member agency of the National Scuba Training Council. Instructor course applicants must be certified as a YMCA scuba instructor. Basic course tuition is \$279; instructor course, \$149. Tuition includes photo equipment, boat fees, air fills and film processing. Contact Dick Jacoby, 4915 Pershing Rd., Downers Grove, IL 60515.

9-18 Project Ocean Search—Atlantic

Jean-Michel Cousteau Institute offers a nine-day exploration of the saltmarsh and coastal environments among South Carolina's historically rich sea islands. Ocean diving studies will involve surveys of artificial reefs, including a recently sunk 442-foot Liberty Ship. The project offers optional Continuing Education Contact Hour credit in association with the Southern California College of Continuing Education. Write the Jean-Michel Cousteau Institute, P.O. Drawer CC, Harbour Town, Hilton Head Island, SC 29928.

23-Aug 12 Project Ocean Search—Caribbean

Jean-Michel Cousteau Institute is planning an expedition to the easternmost Lesser Antilles for underwater and terrestrial examinations of ecological systems and archaeological digs. Jean-Michel Cousteau Institute, P.O. Drawer CC, Harbour Town, Hilton Head Island, SC 29928.

28-Aug 10 Teacher Workshop in the Keys
See program description for July 7-20.

August

4-11 Underwater Medicine Program

Lucaya, Bahamas, will be the site of the Ninth International Physicians Underwater Medicine Program. Sponsored by the Undersea Medical Society, the academic program offers an approved 25 hours of Category I Continuing Medical Education credits for the Physicians' Recognition Award of the American Medical Association. In addition to the medical seminar, Lee Turcotte's Atlantis Safaris has arranged a complete diving program through the Underwater Explorers Society. Reef trips will be scheduled each day during non-lecture hours. Write PUMP, P.O. Box 530344, Miami, FL 33153.

11 Treasure Hunt

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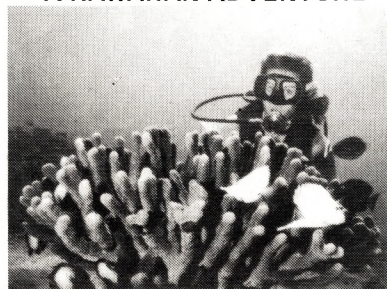
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CALENDAR *continued*

prizes and merchandise including a four-day trip for two to Freeport, Bahamas, and 19 other prizes. Sponsored by Sunken Treasure Dive Shop and Seese Music, the event will begin Friday night, August 10, with an informal get-together and film showing for early arrivals. Contact Rich Best at (717) 398-1458.

11-12 Cave Diving Forum

The National Association for Cave Diving will host a weekend forum in north Florida designed to acquaint certified instructors with the techniques and safe practice of cave diving. The program objective is "not to teach or promote cave diving, but to increase understanding of the problems and potential hazards associated with the sport." Participants will be awarded a certificate of program completion. Contact the National Association for Cave Diving, P.O. Box 1518, High Springs, FL 32643.

19-26 Physician's Undersea Medicine Program

A program emphasizing the medical and physiological aspects of diving safety and education will be conducted on Grand Cayman Island, BWI. The course carries 30 Category I CME credits and has been approved by the American Medical Association and the American Academy of Family Physicians. Write: Program Director, Dept. 1260, Human Underwater Biology, P.O. Box 5893, San Antonio, TX 78201.

October

11-14 IQ Eleven

The Eleventh International Conference on Underwater Education will convene October 11 in Houston, Texas for four days of informative workshops, exhibits, pool demonstrations, debates and social functions. The Shamrock Hilton exhibit hall will accommodate this year's program, titled "Diver Instruction: A Rewarding Challenge." Prominent underwater educators, leaders in equipment design, diving instructors, manufacturers and retailers of diving equipment will make presentations and be available for informal consultation. For more information, contact Jeanne Bear Sleeper or Cheri Boone, NAUI Headquarters, P.O. Box 630, Colton, CA 92324.

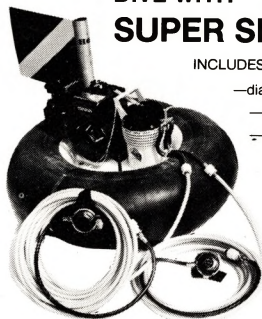
27-Nov 1 Cayman U/W Photo Contest

A week-long underwater photo contest pits visiting divers against each other in a competition for the best overall roll of color film shot in Cayman waters between October 27 and November 1. Prizes include a seven-day diving vacation on Grand Cayman and a Nikonos III camera. Contact Ron and Nancy Sefton, P.O. Box

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27-Nov 14 Underwater Medicine Program

The Seventeenth International Physicians Underwater Medicine Program to be held in Jerusalem will include a week of sight-seeing excursions to the Old City, Jericho, Massada, the Dead Sea, the sunken Roman city of Caesarea and eight days of Red Sea diving. The academic program offers 25 Category I credits for studies including diving physiology, effects of elevated partial pressures, pressure change, decompression theory, hyperbaric treatments, near drowning, poisonous and venomous marine life and case discussions. Contact PUMP, P.O. Box 530344, Miami, FL 33153.

November

2-10 Innerspace Pacifica 79

Six of the finest underwater movies ever made will be featured along with diving seminars and a photo contest at Innerspace Pacifica 79 in Hawaii. The underwater film festival is sponsored by the Hawaii Council of Diving Clubs and will be at Honolulu's Kaimuki High School Nov. 2 and 3, Wailuku, Maui Nov. 9 and in Hilo on Nov. 10. This is the first time the festival comes to Hilo due to diver demand. The Triton Award given to the person who contributes the most to diving in the islands will also be awarded. For entry forms, tickets or contest data contact Innerspace Pacifica 79, P.O. Box 3061, Honolulu, HI 96802.

On the Horizon

If you're in the Midwest in November, try to catch Rich Frehsee's narrative of the third annual Rockford Divers Association film festival in South Beloit, IL on Nov. 9-10. Frehsee's work has appeared in *Sport Diver*, *Skin Diver*, *National Geographic*, *Life*, *Time*, *Argosy* and *Oceans*. Tickets for the symposium are \$3. Contact Bill Steinborn, 1385 Randall Dr., Rockford, IL 61108.

Make plans now for the 4th Annual Diving Equipment Manufacturers Association (DEMA) trade show and convention scheduled for January 19-22, 1980, in New Orleans. Dive equipment manufacturers, travel agencies, photo retailers and certifying agencies are preparing for the largest show ever, and more than half of the available 305 exhibit spaces have already been sold. Cocktail parties, film presentations, seminars, meetings and clinics are now being organized for the January show. Contact Shirley Gray, DEMA, P.O. Box 4067, Irvine, CA 92716. (C)

SPORT DIVER

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I Learned About Diving From That

*I imagined I was raking gold coins
into my treasure chest.*

BY LOU FEAD

Diving off the coast of California a near-fatal encounter brought me face to face with one of the most insidious hazards a diver can confront—greed.

The sun was bright, the sky blue and the air silent as Bill DeCourt and I embarked in a borrowed boat bound for Los Coronados Islands. South of San Diego in the open Pacific, these four pieces of Mexican real estate lie about seven miles off the west coast of Baja California. Surrounded by kelp beds teeming with marine life, from giant elephant seals to minute nudibranchs, these islands harbor some of Southern California's best diving.

We anchored off the southern tip of North Island where huge churning seas usually make diving impossible. This day the ocean was uncharacteristically flat calm.

Opening our eyes after backrolling into the 55-degree water, we were amazed to find better than 80 feet of visibility. Conditions were ideal for scouting the forbidding seascape on this, my tenth dive after basic certification.

Excited by the spectacular visibility, we scanned the island's submerged slopes. They plummeted into the depths as steeply as the exposed cliffs shot toward the sky, shimmering in muted splashes of color—the Chinese red of juvenile garibaldi near the surface, the cobalt blue depths at the limit of visibility.

Suddenly Bill grabbed my arm. He was pointing straight down and literally dancing a jig.

There, 60 feet below, was a huge fishing net draped over the jagged outcroppings of a deep reef. Abandoned by a trawler some stormy dawn, the net stretched out of sight in all directions.

*Lou Fead is a freelance writer and instructor. Author of the book **Easy Diver**, Lou has directed several international education conferences for NAUI.*

No wonder Bill was excited; this was real treasure.

My thoughts rushed back to dry land, to the local waterfront sign: "Home of the world famous San Diego fishing fleet...the purse seine nets used cost more than \$20,000 each."

If the net we'd found was worth even a quarter of that, we could afford our own dive boat.

As visions of riches filled our presurized brains, we raced to the bottom, hardly noticing the 90-foot depth. I

*As visions of
riches filled our brains
we raced to the
bottom without noticing
the 90-foot depth.*

settled into the middle of the net, ringed by floats and sinkers, while Bill went to find an end. Already planning our salvage, I started gathering the net for hoisting to the surface.

As I pulled and tugged the pile of sinkers grew larger around my fins. I imagined I was raking gold coins into my treasure chest. I pulled and raked. The coins stacked higher.

Clouds of bubbles blossomed from my regulator with each yank on the net. Soon I was lost in a flurry of bubbles, and my lungs were working harder than my arms.

What was going on? I was sucking harder but getting less. I felt like I was running out of air. My gauge still showed 1000 psi and my regulator was pumping out the bubbles, but I just couldn't get enough air.

Here I was, struggling for breath with almost half a tank of air left.

My brain told me I'd better get to

the surface fast, but my body offered immediate objection. The world spun and started turning black.

I was passing out—90 feet down.

As my vision eclipsed to tiny pinpoints, I grabbed the last thing I could see—one of the net floats—and held on for dear life. Hovering about ten feet above the bottom, that float was my only connection with reality. Through the wild tingling in my fingers I could feel the float, but couldn't see it. I couldn't tell up from down, right from left. Wrapped around the float, hyperventilating, I hoped I would live through this dive.

Slowly my panting abated. The darkness was thinning; the merry-go-round slowed. Whatever had threatened my life was leaving, though my white knuckles still clutched the float. After five motionless minutes I could breathe, see and tell which way was up. I left the float and swam very deliberately to the surface.

What had happened? I found out later from instructors and textbooks that I had been poisoned by carbon dioxide. The CO₂ overdose had built up because my lungs weren't being ventilated sufficiently to blow off all the gas my body generated. The small air passages in sport scuba regulators just can't handle the volume of ventilation needed during periods of intense manual labor. That's why commercial divers still use hardhats for the heavy work. Pros use scuba mainly for inspection and survey.

I had literally worked myself almost to death. I was saved only by stopping and remaining still until my body eliminated the dangerous CO₂ buildup.

When I dive now, I do it with as little effort as possible. I don't need another bout with gas poisoning to convince me that sport scuba gear is for fun, not work. That prized fishing net never earned me a dive boat, but it taught me a lesson I won't soon forget. ☺

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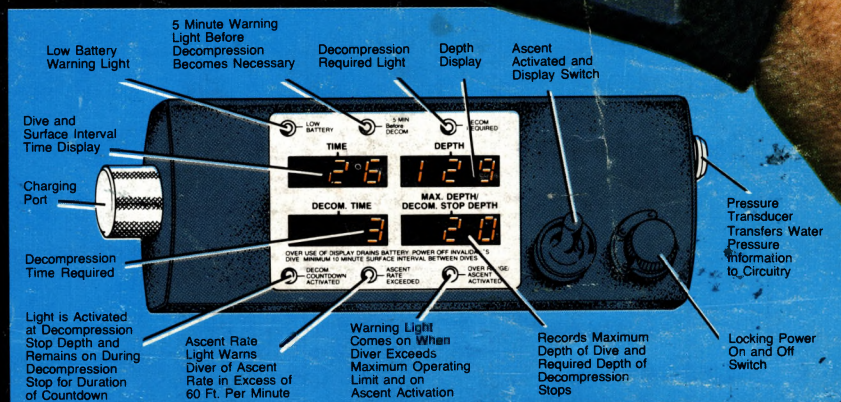
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